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(71)Applicant : AISIN AW CO LTD

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(72)Inventor : TANIGUCHI TAKAO
TSUKAMOTO KAZUMASA
HAYABUCHI MASAHIRO
KASUYA SATORU
KATO HIROSHI
NISHIDA MASAOKI
KATO AKITOSHI

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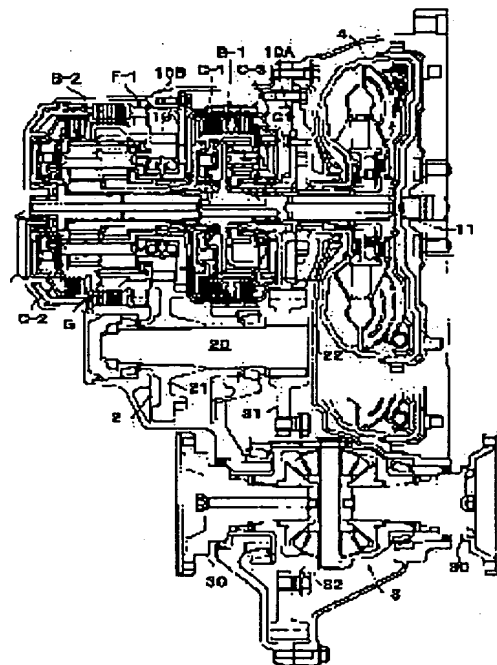
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(54) AUTOMATIC TRANSMISSION FOR VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To reduce light weight and to miniaturize a mechanism against a speed-change stage number by shortening a high torque transmission route while ensuring a transmission capacity of two clutches carrying out a high torque transmission in a multi-stage automatic transmission for a vehicle.

SOLUTION: The automatic transmission accomplishing a multi-stage speed-change stage is provided with a speed-reduction planetary gear G1; at least two clutches C-1, C-3 for transmitting a speed-reduction rotation therethrough; and a planetary gear set G for inputting a speed-reduction rotation passed through two clutches C-1, C-3. The speed-reduction planetary gear G1 and two clutches C-1, C-3 are disposed at one side of the planetary gear set G and the speed-reduction planetary gear G1 is disposed between both clutches C-1, C-3.



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CLAIMS

[Claim(s)]

[Claim 1] Moderation planetary gear and at least two clutches which transmit the moderation rotation which passed through these moderation planetary gear, In the automatic transmission for cars which attains a multistage gear ratio with the planetary-gear set into which the moderation rotation which passed through these two clutches is inputted Moderation planetary gear and the 1st and 3rd clutches which input the moderation rotation which passed through these moderation planetary gear into two elements with which planetary-gear sets differ, respectively are arranged at the one side of said planetary-gear set. Moderation planetary gear are automatic transmissions for cars characterized by having been arranged between the 1st clutch and the 3rd clutch.

[Claim 2] While the 1st element is connected with the output side member of the 1st clutch and the 2nd element is connected with the output side member of the 3rd clutch, said planetary-gear set While connecting with the output side member of the 2nd clutch into which a stop in a change gear case is enabled by the 1st stop means, and the 3rd element inputs non-slowng down rotation The automatic transmission for cars according to claim 1 with which the stop in a change gear case was enabled by the 2nd stop means, and the 4th element was connected with the output member.

[Claim 3] Said moderation planetary gear have one element fixed at the tip of the boss section which carries out total material from a change gear case. The 3rd clutch The hydraulic servo is supported by the periphery of said boss section free [rotation]. The 1st clutch It is the automatic transmission for cars according to claim 1 or 2 with which one element of the 3rd clutch and a planetary-gear set was connected by arranging the hydraulic servo on an input shaft by the power transfer member which passes along the periphery of the 1st clutch.

[Claim 4] The output element of said moderation planetary gear is directly connected with the clutch hub which engages with the inner circumference side of the friction member of the 3rd clutch. The hydraulic servo of the 3rd clutch The engaged clutch drum is connected [side / of the friction member of the 3rd clutch / periphery] towards the sense which carries out opening of the cylinder to a moderation planetary-gear side. This clutch drum The automatic transmission for cars according to claim 3 connected with one element of a planetary-gear set through said power transfer member.

[Claim 5] The hydraulic servo which the engaged clutch hub is connected with the output element of moderation planetary gear, and the engaged clutch drum is connected and connects [side / of the friction member of said 1st clutch / inner circumference / side / of the friction member of the 1st clutch / periphery / element / of a planetary-gear set / one] it at the clutch drum of the 1st clutch is an automatic transmission for cars according to claim 4 arranged towards the sense which carries out opening of the cylinder to a moderation planetary-gear side.

[Claim 6] It is an automatic transmission for [this clutch hub was extended / for / by shaft orientations and was further connected / for / shaft orientations / side / of the friction member of the 1st clutch / inner circumference / by the engaged clutch hub by connecting the output element of said moderation planetary gear with the clutch hub which engages with the inner circumference side of the friction member of the 3rd clutch arranged at the periphery side of moderation planetary gear] cars according to claim 5.

[Claim 7] It is the automatic transmission for cars according to claim 4 with which in the hydraulic servo of said 1st clutch the cylinder has been arranged towards the sense which carries out opening, and, as for moderation planetary gear, was connected [opposite direction] by the clutch drum of the 1st clutch by the periphery side, and the clutch drum of this 1st clutch was connected with the output element of moderation planetary gear.

[Claim 8] The output element of said moderation planetary gear is the automatic transmission for cars

according to claim 7 which was connected with the clutch hub which engages with the inner circumference side of the friction member of the 3rd clutch arranged at the periphery side of moderation planetary gear, is on the shaft-orientations extension and was connected with the clutch drum of the 1st clutch.

[Claim 9] The hydraulic servo connected [drum / of said 3rd clutch / clutch] is an automatic transmission according to claim 4 which has a supporter to the boss section in the location which laps in moderation planetary gear and the direction of a path.

[Claim 10] Said 1st stop means is the automatic transmission for cars according to claim 4 or 9 which consisted of band brakes and was made into the engagement side of a band in the peripheral face of the clutch drum of the 3rd clutch.

[Claim 11] It is the automatic transmission for cars according to claim 3 with which the supply oilway of the hydraulic servo of the 1st clutch was opened for free passage by the oilway prepared in the change gear case through the oilway within a shaft prepared in the input shaft by preparing the supply oilway of the hydraulic servo of said 3rd clutch in the boss section.

[Claim 12] Said supply oilway which said moderation planetary gear, the 1st clutch, and the 3rd clutch have been arranged at the posterior part of a change gear, and was prepared in the input shaft is the automatic transmission for cars according to claim 11 to which the oilway prepared in the change gear case in the back end section of an input shaft was open for free passage, and the sealing device of between an input shaft and change gear cases was carried out with one seal ring.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to arrangement of each change gear component in the gear train about the automatic transmission for cars.

[0002]

[Description of the Prior Art] For improvement in fuel consumption indispensable not only to reservation of the drivability of a car but energy saving, the automatic transmission for cars has the demand of multistage-izing, and such a demand to a change gear style is shifting to the thing of the 5th speed from the thing of the conventional advance 4th speed. Meanwhile, in order to realize further multistage-ization in the limited car loading tooth space, much more formation of a small element of a gear train and the simplification of a device are needed. Then, the gear train which attains advance 6 ** and the go-astern 1st speed using the planetary-gear set which consists of the minimum gear change element is proposed in JP,4-219553,A. The gear train concerning this proposal makes input rotation and two moderation rotations which slowed it down input into the planetary-gear set which consists of four gear change elements of a change gear style suitably as an input from which two rates differ, and attains multistage advance 6 **.

[0003]

[Problem(s) to be Solved by the Invention] Although the gear train configuration concerning the above-mentioned proposal is very rational in the number of the number of gear change elements per gear ratio, the clutch to need, and brakes, it includes the trouble in respect of practical use which should be improved. As a clutch which inputs the moderation rotation via moderation planetary gear into two elements with which planetary-gear sets differ as a description of the above-mentioned gear train especially, respectively, although two moderation rotation transfer clutches are needed, these clutches need reservation of a bigger torque capacity than the clutch which inputs the usual non-slowng down rotation from the place which transmits the torque amplified by moderation. Two moderation rotation transfer clutches are arranged to the one side of the moderation planetary gear which always used the sun gear as the reaction force element of immobilization by the above-mentioned Prior art about this point, and especially about the clutch of one of these, since it arranges in the location distant from moderation planetary gear, the member which transmits high torque inevitably becomes long. Therefore, there is a trouble which causes the enlargement and the increment in weight in a change gear.

[0004] Then, securing the torque capacity of two clutches for a moderation input in the change gear style which attains multistage gear change in inputting two moderation rotations into a planetary-gear set, this invention is shortening a high torque-transmission path, and aims at offering the automatic transmission for cars which prevented the increment in weight for enlargement of a change gear style.

[0005]

[Means for Solving the Problem] At least two clutches with which this invention transmits the moderation rotation to which it passed through moderation planetary gear and these moderation planetary gear in order to attain the above-mentioned purpose, In the automatic transmission for cars which attains a multistage gear ratio with the planetary-gear set into which the moderation rotation which passed through these two clutches is inputted Moderation planetary gear and the 1st and 3rd clutches which input the moderation rotation which passed through these moderation planetary gear into two elements with which planetary-gear sets differ, respectively are arranged at the one side of said planetary-gear set. Moderation planetary gear are characterized by having been arranged between the 1st clutch and the 3rd clutch.

[0006] When using the above-mentioned change gear as the change gear of advance 6 **, and said planetary-gear set While the 1st element is connected with the output side member of the 1st clutch and the

2nd element is connected with the output side member of the 3rd clutch. It is effective for a stop in a change gear case to be enabled by the 1st stop means, and for a stop in a change gear case to be enabled by the 2nd stop means, and to consider as the configuration by which the 4th element was connected with the output member, while connecting with the output side member of the 2nd clutch into which the 3rd element inputs non-slowng down rotation.

[0007] In the above-mentioned configuration said moderation planetary gear. One element is fixed at the tip of the boss section which carries out total material from a change gear case. The 3rd clutch. The hydraulic servo is supported by the periphery of said boss section free [rotation], the hydraulic servo is arranged on an input shaft, and, as for the 1st clutch, as for one element of the 3rd clutch and a planetary-gear set, it is effective to consider as the configuration connected by the power transfer member which passes along the periphery of the 1st clutch.

[0008] Furthermore, the output element of said moderation planetary gear. It connects with the clutch hub which engages with the inner circumference side of the friction member of the 3rd clutch directly. The hydraulic servo of the 3rd clutch. The engaged clutch drum is connected [side / of the friction member of the 3rd clutch / periphery] towards the sense which carries out opening of the cylinder to a moderation planetary-gear side, and, as for this clutch drum, it is effective to consider as the configuration connected with one element of a planetary-gear set through said power transfer member.

[0009] Furthermore, as for the hydraulic servo which the engaged clutch hub is connected, and the engaged clutch drum is connected and connects [side / of the friction member of said 1st clutch / inner-circumference / element / of moderation planetary gear / output / side / of the friction member of the 1st clutch / periphery / element / of a planetary-gear set / one] it at the clutch drum of the 1st clutch, it is effective to consider as the configuration arranged towards the sense which carries out opening of the cylinder to a moderation planetary-gear side.

[0010] In the above-mentioned case, the output element of said moderation planetary gear is connected in the clutch hub which engages with the inner circumference side of the friction member of the 3rd clutch arranged at the periphery side of moderation planetary gear, and, as for this clutch hub, it is effective to consider as the configuration which was extended by shaft orientations and was further connected [shaft orientations / side / of the friction member of the 1st clutch / inner circumference] by the engaged clutch hub.

[0011] Moreover, in the hydraulic servo of said 1st clutch, with moderation planetary gear, the cylinder is arranged towards the sense which carries out opening, and is connected [opposite direction] by the clutch drum of the 1st clutch by the periphery side, and, as for the clutch drum of this 1st clutch, it is also effective to consider as the configuration connected with the output element of moderation planetary gear.

[0012] Moreover, in the hydraulic servo of said 1st clutch, with moderation planetary gear, the cylinder is arranged towards the sense which carries out opening, and is connected [opposite direction] by the clutch drum of the 1st clutch by the periphery side, and the clutch drum of this 1st clutch is good also as a configuration connected with the output element of moderation planetary gear.

[0013] Furthermore, as for the hydraulic servo connected [drum / of said 3rd clutch / clutch], it is also effective in the location which laps in moderation planetary gear and the direction of a path to consider as the configuration which has a supporter to the boss section.

[0014] Moreover, as for said 1st stop means, it is also effective to consist of band brakes and to consider the peripheral face of the clutch drum of the 3rd clutch as the configuration made into the engagement side of a band.

[0015] Moreover, the supply oilway of the hydraulic servo of said 3rd clutch is prepared in the boss section, and, as for the supply oilway of the hydraulic servo of the 1st clutch, it is effective to consider as the configuration opened for free passage by the oilway prepared in the change gear case through the oilway within a shaft prepared in the input shaft.

[0016] Furthermore, as for said supply oilway which said moderation planetary gear, the 1st clutch, and the 3rd clutch have been arranged at the posterior part of a change gear, and was prepared in the input shaft, it is effective that the oilway prepared in the change gear case in the back end section of an input shaft is open for free passage, and between an input shaft and change gear cases considers as the configuration by which the sealing device was carried out with one seal ring.

[0017]

[Function and Effect of the Invention] Since the 1st clutch and 3rd clutch which the configuration of the claim 1 above-mentioned publication takes quantity torque capacity in order to transmit the torque amplified through moderation planetary gear can be brought close to both moderation planetary gear, and can be

arranged and the die length of the member which constitutes the path which transmits high torque can be shortened, the light weight of a change gear and miniaturization can be attained.

[0018] Next, a configuration according to claim 2 can attain the above-mentioned effectiveness in the change gear which can realize the change gear style of the gear ratio of good 6 ** with the small number of elements.

[0019] And with a configuration according to claim 3, since one element of moderation planetary gear was always fixed in the boss section by which total material was carried out from the change gear case, miniaturization of a change gear can be attained, being able to use arrangement of the support as a support means of dedication for immobilization as unnecessary. Moreover, although the power transfer member which connects the 3rd clutch and planetary-gear set will pass along the periphery of the 1st clutch by this configuration, compared with the case where it arranges on the boss section like the conventional technique, the pressure receiving side of a hydraulic servo can be extended to an inner circumference side by arranging the hydraulic servo of the 1st clutch on the input shaft of a minor diameter from the boss section. Therefore, clutch capacity is securable by enlarging the projected net area of the hydraulic servo also about the 1st clutch with which reservation of clutch capacity becomes difficult by an outer-diameter side being regulated.

[0020] Next, with a configuration according to claim 4, since the output of moderation planetary gear is transmitted to the hub which is the input flank material of the friction member of the 3rd clutch directly, without minding other members, the output side transfer path of moderation planetary gear of transmitting high torque can be shortened. Moreover, since the thinning of the hydraulic servo which connects [hub / of the 3rd clutch / hydraulic servo / by the side of inner circumference] it at a clutch drum since the high torque transmitted is transmitted to a planetary-gear set from the clutch drum by the side of a periphery, without giving a torque load is possible, a change gear can be constituted in lightweight and a compact.

[0021] Moreover, with a configuration according to claim 5, since the power transfer member which connects between the 1st clutch and 1 gear-change elements of a planetary-gear set can be communalized with the cylinder of the hydraulic servo of the 1st clutch, the number of rotation members can be reduced and, thereby, a change gear can be miniaturized.

[0022] Moreover, with a configuration according to claim 6, while being able to shorten the transfer path of the output element of moderation planetary gear, and the input flank material of the 3rd clutch by arranging the friction member of the 3rd clutch to the periphery side of moderation planetary gear, the member which constitutes the output side transfer path which connects the 3rd clutch which is separated from the planetary-gear set and planetary-gear set can also be shortened. Moreover, by using the inner circumference side hub of the 1st clutch and the 3rd clutch as a common member, since communalization of a member and compaction of a high torque-transmission member accomplish, it becomes the light weight of a change gear, and miniaturizable.

[0023] And with a configuration according to claim 7, without giving a high torque load to the hydraulic servo connected [side / of a drum / inner circumference], not only about the 3rd clutch but about the 1st clutch, by the transfer of high torque to a drum from KURATCHIBABU, in order that the torque transmission by the side of a periphery may accomplish, the thinning of the cylinder of the hydraulic servo by the side of inner circumference becomes possible, and this becomes the light weight of a change gear, and miniaturizable.

[0024] Moreover, with a configuration according to claim 8, while being able to shorten the transfer path of the output element of moderation planetary gear, and the input flank material of the 3rd clutch by arranging the friction member of the 3rd clutch to the periphery side of moderation planetary gear, the member which constitutes the output side transfer path which connects the 3rd clutch which is separated from the planetary-gear set and planetary-gear set can also be shortened. Moreover, by using the inner circumference side hub of the 1st clutch and the 3rd clutch as a common member, since communalization of a member and compaction of a high torque-transmission member accomplish, it becomes the light weight of a change gear, and miniaturizable.

[0025] Furthermore, with a configuration according to claim 9, since support of the drum of the 3rd clutch can be performed in the location which laps in moderation planetary gear and the direction of a path, the shaft-orientations tooth spaces for drum support can be reduced, and the shaft-orientations dimension of a change gear can be shortened.

[0026] With a configuration according to claim 10, the 1st stop means by moreover, the thing to consider as the band brake which can make very small the direction arrangement tooth space of a path The tooth space of the outer-diameter direction of the 3rd clutch is secured considering as the arrangement which piled up

the 1st stop means and 3rd clutch connected with the 2nd element of a planetary-gear set both in the direction of a path. Major-diameter-ization of this clutch can be attained and the axial length of a clutch can be shortened by reservation of the torque-transmission capacity by it. Moreover, since the clutch drum of the 3rd clutch is supported by the hydraulic servo free [rotation on the boss section], support of the drum by band-izing can be ensured.

[0027] Moreover, with a configuration according to claim 11, the number of seal rings used as the factor which reduces a transmission efficiency according to generating of a sliding friction can be lessened, miniaturizing the arrangement tooth space of moderation planetary gear, the 1st clutch, and the 3rd clutch.

[0028] And with a configuration according to claim 12, decline in the transmission efficiency according the increment in the number of seal rings for the sealing device of the supply oilway accompanying supplying oil pressure to the 1st clutch through an input shaft to the 1st clutch by connecting with a change gear case the oilway which supplies oil pressure through the axis end of an input shaft to the minimum prevention and the increment in a sliding friction can be prevented.

[0029]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained along with a drawing. Drawing 1 develops between shafts in a common flat surface, and shows the gear train of 1 operation gestalt of the automatic transmission which materialized this invention by the skeleton. Moreover, drawing 2 shows actual axial physical relationship for the above-mentioned automatic transmission, in view of an end face. This automatic transmission is having the multistage gear ratio attained by the planetary-gear set G into which the moderation rotation which passed through the moderation planetary gear G1, two clutches (C-1, C-3) which transmit the moderation rotation which passed through the moderation planetary gear G1, and these two clutches is inputted. And the moderation planetary gear G1 and the 1st and 3rd clutches (C-1, C-3) which input the moderation rotation which passed through it into two elements S2 and S3 with which the planetary-gear sets G differ, respectively are arranged at the one side of the planetary-gear set G, and the moderation planetary gear G1 are arranged between the 1st clutch (C-1) and the 3rd clutch (C-3).

[0030] Hereafter, the still more concrete gear train configuration of this automatic transmission is explained. This change gear has taken the gestalt of the horizontal type transformer axle for a front engine front-drive (FF) vehicle or rear engine Riyadh live (RR) vehicles, and as shown in drawing 1 and drawing 2, it is considered as 3 shaft configurations in which each element of a change gear style was arranged on each shaft of the main shaft X each other arranged in juxtaposition, the counter shaft Y, and the differential-gear shaft Z. And the change gear style which equips the surroundings of the input shaft 11 on a main shaft X with the planetary-gear set G and the moderation planetary gear G1 which have four gear change elements S2, S3, C2 (C3), and R2 (R3), two brakes (B-1, B-2), and three clutches (C-1, C-2, C-3) is arranged. In this gear train, the input element S3 of one moderation rotation of the planetary-gear set G is connected with an input shaft 11 through the moderation planetary gear G1 with the 1st clutch (C-1). While the input element S2 of another side is connected with an input shaft 11 through the moderation planetary gear G1 with the 3rd clutch (C-3) A stop in the change gear case 10 is enabled by the 1st brake (B-1). While the input element C2 (C3) of non-slowng down rotation is connected with an input shaft 11 with the 2nd clutch (C-2), a stop in the change gear case 10 is enabled by the 2nd brake (B-2). The remaining gear change elements R2 (R3) as an output element It connects with the counter drive gear 19 as an output element on a main shaft X.

[0031] In addition, although the brake (B-2) other than the above was made to stand in a row as an engagement element and the one-way clutch (F-1) is arranged in the gear train shown in drawing This avoids the complicated oil pressure control for a hold substitute of the brake at the time of the 1 ->2 gear change described minutely later (B-2), and a brake (B-1). Except for the above transitional functions, it is [that release control of a brake (B-2) should be simplified] essentially equivalent to a brake (B-2) using the one-way clutch (F-1) which releases the engagement force naturally with engagement of a brake (B-1).

[0032] Moreover, on the main shaft X, it connects with the engine which is not illustrated and the torque converter 4 with a lock-up clutch which transmits the rotation to an input shaft 11 is arranged. And counter gear 2 are arranged on the counter shaft Y. The counter driven gear 21 of the major diameter which counter gear 2 are fixed to the counter shaft 20, and gears on the counter drive gear 19 as an output member on a main shaft X, While being fixed to the counter shaft 20 similarly, arranging the differential-gear drive pinion gear 22 of the minor diameter as an output element on the counter shaft Y and slowing down the output from a main shaft X side by these While obtaining a proper final drive gear ratio by making it reversed and transmitting to differential equipment 3, the function to double the hand of cut of an input shaft 11 and the hand of cut of the output from differential equipment 3 is achieved. Differential equipment 3 is arranged on

the differential-gear shaft Z. Differential equipment 3 meshes the differential-gear ring wheel 31 fixed to the differential case 32 to the differential-gear drive pinion gear 22, and is connected with the counter shaft 20, and differential rotation of the differential gear arranged in a differential case 32 is considered as the configuration outputted to a lateral axis 30, and let this output be final wheel driving force.

[0033] The planetary-gear set G is [the carrier C2 (C3) which supports the long pinion P2 which gears with the sun gear S2 of a major diameter, and the sun gear S3 of a minor diameter mutually, and the short pinion P3, and] a ring wheel R2 (R3) (although two gears are constituted theoretically, this ring wheel). Since parenchyma is one gear located only in the periphery side of one of sun gears Writing only one cable address in addition as R2 or R3 according to the location to a sun gear below is constituted. It consists of RABINIYO-type gear sets with which the long pinion P2 gears with to the sun gear S2 and ring wheel R2 of a major diameter, and the short pinion P3 gears to the sun gear S3 of a minor diameter. And with this gestalt, the input element of moderation rotation of the sun gear S2 of a major diameter and the sun gear S3 of a minor diameter and a carrier C2 (C3) are used as the input element of non-slowng down rotation, and let the ring wheel R2 be an output element. The sun gear S3 of the minor diameter of the planetary-gear set G is connected with the output side member of a clutch (C-1), and while the sun gear S2 of a major diameter is connected with the output side member of a clutch (C-3), the stop of it in the automatic-transmission case 10 is enabled by the brake (B-1) which consists of band brakes. Moreover, while a carrier C2 (C3) is connected with an input shaft 11 through a clutch (C-2) and the stop of it is enabled by the brake (B-2) at the change gear case 10, the one direction rotation stop of it in the change gear case 10 is enabled with the one-way clutch (F-1). And the ring wheel R2 is connected with the counter drive gear 19.

[0034] Fix the sun gear S1 as the one element to the change gear case 10, and the moderation planetary gear G1 are connected with an input shaft 11, are made to connect it with the output side member of a clutch (C-1) and a clutch (C-3) by using a carrier C1 as an output element, using a ring wheel R1 as an input element, and are connected with the planetary-gear set G by the above-mentioned connection relation.

[0035] The automatic transmission which consists of such a configuration changes gears based on a car load in the range of the gear ratio according to the range chosen by the operator by control by the electronic control and hydraulic control which are not illustrated. Drawing 3 diagrammatizes and shows the gear ratio attained by engagement and release (engagement is expressed with O mark and release is expressed with the-less mark) of each clutch and a brake. Moreover, drawing 4 shows the relation between the gear ratio attained by engagement (those engagement is expressed with - mark) of each clutch and a brake, and the rotational frequency ratio of each gear change element at that time with a velocity diagram.

[0036] The 1st ** (1ST) is engagement (in this gestalt, although it replaces with engagement of this brake (B-2) and automatic engagement of an one-way clutch (F-1) is used so that it may understand with reference to an actuation table) of a clutch (C-1) and a brake (B-2) so that both drawings may be combined and referred to and may be known. why the reason for using this engagement and this engagement are equivalent to engagement of a brake (B-2) is explained in full detail behind. It is attained. In this case, reaction force is taken on the carrier C3 on which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the sun gear S3 of a minor diameter via the clutch (C-1), and was stopped by the change gear case 10 by engagement of an one-way clutch (F-1), and moderation rotation of the maximum reduction gear ratio of a ring wheel R2 is outputted to the counter drive gear 19.

[0037] Next, the 2nd ** (2ND) is attained by engagement of a clutch (C-1) and a brake (B-1). In this case, reaction force is taken to the sun gear S2 of the major diameter by which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the sun gear S3 of a minor diameter via the clutch (C-1), and was stopped by the change gear case 10 by engagement of a brake (B-1), and moderation rotation of a ring wheel R2 is outputted to the counter drive gear 19. The reduction gear ratio at this time becomes smaller than the 1st ** (1ST) so that it may see to drawing 4.

[0038] Moreover, the 3rd ** (3RD) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into the sun gear S2 of a major diameter, and the sun gear S3 of a minor diameter via a clutch (C-1) and a clutch (C-3) at coincidence. Since the planetary-gear set G will be in a direct connection condition, rotation of the same ring wheel R2 as the input rotation to both sun gears is outputted to the counter drive gear 19 as rotation slowed down to rotation of an input shaft 11.

[0039] Furthermore, the 4th ** (4TH) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into the sun gear S3 of a minor diameter via a clutch (C-1). The non-slowng down rotation inputted via the clutch (C-2) from the input shaft 11 on the other hand is inputted into a

carrier C2 (C3), and middle rotation of two input rotations is outputted to the counter drive gear 19 as rotation of the ring wheel R2 slightly slowed down to rotation of an input shaft 11.

[0040] Next, the 5th ** (5TH) is attained by coincidence engagement of a clutch (C-2) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into the sun gear S2 of a major diameter via a clutch (C-3). The rotation which the non-slowng down rotation inputted via the clutch (C-2) from the input shaft 11 was inputted into the carrier C2 (C3), and accelerated it on the other hand more slightly than rotation of the input shaft 11 of a ring wheel R2 is outputted to the counter drive gear 19.

[0041] And the 6th ** (6TH) is attained by engagement of a clutch (C-2) and a brake (B-1). In this case, non-slowng down rotation is inputted only into a carrier C2 (C3) via a clutch (C-2) from an input shaft 11, and the rotation whose sun gear S2 stopped by the change gear case 10 by engagement of a brake (B-1) accelerated further the ring wheel R2 which takes reaction force is outputted to the counter drive gear 19.

[0042] In addition, go-astern (REV) is attained by engagement of a clutch (C-3) and a brake (B-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into a sun gear S2 via a clutch (C-3), and the inversion of the ring wheel R2 which takes reaction force on the carrier C2 (C3) stopped by engagement of a brake (B-2) change gear case 10 is outputted to the counter drive gear 19.

[0043] Here, the relation of the one-way clutch (F-1) and brake (B-2) which touched previously is explained. both [these] brakes serve as the so-called friction engagement element with which one release, simultaneously engagement of another side are performed at the time of an up-and-down shift by both gear change interstage and which holds again and is carried out so that it may see in engagement / release relation of both the brakes at the time of the 1st above ** and the 2nd ** (B-1, B-2). A hold substitute of such a friction engagement element will cause addition of the control valve for it, complication of a hydraulic circuit, etc., in order to need the precise concurrency control of the engagement pressure of the hydraulic servo which operates them, and solution pressure discharge and to perform such control. By then, the thing to consider as a setup which doubled the engagement direction of an one-way clutch (F-1) in the reaction force torque support direction at the time of the 1st ** by the 1st ** and the 2nd ** with this gestalt using the reaction force torque concerning a carrier C2 (C3) being reversed An one-way clutch (F-1) is made to demonstrate a function equivalent to engagement of a parenchyma top brake (B-2). It replaces with engagement of the brake at the time of the 1st ** (B-2) (however, since the direction of the reaction force torque which starts a carrier C2 (C3) in the state of the engine coast of a wheel drive is reversed to the condition of an engine drive). in order to acquire the engine brake effectiveness, as O mark with a parenthesis shows to drawing 3 , engagement of a brake (B-2) is needed -- the carrier C2 (C3) is stopped -- it divides and comes out. Therefore, when attaining a gear ratio, the configuration which attains the 1st ** by engagement of a brake (B-2) can also be taken, without preparing an one-way clutch.

[0044] Thus, each gear ratio attained serves as a good rate step at equal intervals comparatively to each gear ratio so that it may understand qualitatively on the velocity diagram of drawing 4 with reference to spacing of the vertical direction of O mark which shows the velocity ratio of ring wheels R2 and R3. If a numeric value is set up and this relation is expressed quantitatively concretely, it will become the gear ratio shown in drawing 3 . The gear ratio in this case Gear ratio $\lambda_{11}=44/78$ of the sun gear S1 of the moderation planetary gear G1, and a ring wheel R1, If it is set as gear ratio $\lambda_{33}=30/78$ of the sun gear S2 by the side of the major-diameter sun gear of the planetary-gear set G, the sun gear S3 by the side of gear ratio $\lambda_{22}=36/78$ of a ring wheel R2 (R3), and a minor diameter sun gear, and a ring wheel R3 I/O gear ratio The 1st ** : (1ST) $(1+\lambda_{11}) / \lambda_{33}=4.067$ 2nd ** : (2ND) $(1+\lambda_{11}) / (\lambda_{22}+\lambda_{33}) / \lambda_{33}$ The $=2.354$ 3rd ** $(1+\lambda_{22}) / \lambda_{33}$ The $1+\lambda_{11}=1.564$ 4th ** (3RD) (4TH) $(1+\lambda_{11}) / (1+\lambda_{11}-\lambda_{11}, \lambda_{33})=1.161$ the 5th (5TH): $(1+\lambda_{11}) / (1+\lambda_{11}-\lambda_{11}, \lambda_{22})=0.857$ the 6th (6TH): $-- 1/(1+\lambda_{22})=0.684$ go-astern (REV): $--$ it is set to $-(1+\lambda_{11})/\lambda_{22}=-3.389$. and the step between these gear ratio -- the -- the [1 and / between the 2nd speed / :1.73] -- the [2 and / between the 3rd speed / :1.51] -- the [3 and / between the 4th speed / :1.35] -- it is set to :1.25 between 4, and the :1.35 5-6th ** between the 5th speed.

[0045] Next, drawing 5 shows the whole automatic-transmission configuration in the cross section materialized further. Moreover, drawing 6 and drawing 7 expand a part of drawing 5 , respectively, and show it. Although the same reference mark is attached and being replaced with explanation about each component previously explained with reference to the skeleton, the details which cannot be referred to from a skeleton are explained [detail / of drawing 5 and each part] with reference to drawing 6 and drawing 7 about overall physical relationship. In addition, through this specification, vocabulary called a clutch and a

brake shall name generically the hydraulic servo which equips a drum with endocyst or the cylinder by which connection unification (it is called connection in this specification including both mode of these) was carried out as the friction member and actuation device as the drum as a connection member to those input-output elements, a hub, and an engaging-and-releasing member, when they are the things of a multi-plate configuration.

[0046] front end wall 10A by which the change gear case 10 consists of an oil pump cover of case body 10B equipped with 10f of peripheral wall sections whose diameter is expanded in the shape of a taper toward the front from back end wall 10e, the oil pump body which closes opening of the front end, and immobilization in it, and bolt stop immobilization is carried out at case body 10B, and ***** of case body 10B -- support wall 10C by which bolt stop immobilization is carried out is mostly consisted of by the center section. and to 10f inside of peripheral wall sections of body 10B Spline 10g which reaches back end wall 10e mostly from opening of the front end is formed. To back end wall 10e After carrying out total material from a back end wall and projecting ahead that the back end of an input shaft 11 should be supported, annular wall 10e' which constitutes the inner circle wall of the cylinder of the hydraulic servo of the brake (B-2) a full account of is given side boss section 10b later is formed. Moreover, before consisting of the boss section which total material is carried out and projects back from an oil pump cover, and a lobe into the change gear case 10 of the sleeve shaft 13 fitted in the inner circumference, side boss section 10a is formed in front end wall 10A. Furthermore, the inner circumference is back extended in support wall 10C, and 10h of central boss sections which constitute the supporter of the counter drive gear 19 is formed in it.

[0047] An input shaft 11 is divided into order biaxial 11A and 11B from on [of processing] expedient, connection unification is mutually carried out by spline engagement, oilway 11 within shaft r for lubrication pressure supply and oilway 11 within shaft p for servo pressure supply are formed in the shaft of axial first portion 11A, and 11s of oilways within a shaft for lubrication pressure supply is formed in the shaft of section 11B in the second half of a shaft. Moreover, flange 11a is formed in the periphery of the back end approach of axial first portion 11A, and flange 11b is formed in the periphery of the back end approach of section 11B in the second half of a shaft. And axial first portion 11A is the direct anterior part of inner circumference side [of an oil-pump arrangement location], and flange 11a. It is supported by the sleeve shaft 13 which constitutes before side boss section 10a through a bush, respectively. In the second half of a shaft section 11B Are spline engagement to axial first portion 11A about the front end, and the direction support of a path of the back end is carried out through bearing at backside [a case 10] boss section 10b. Shaft-orientations support is carried out by thrust bearing infixed between each flange 11a and 11b which was made to adjoin a supporter and was formed, and both boss section 10a and 10b tip.

[0048] The planetary-gear set G is arranged in the second half of the shaft of an input shaft 11 at the periphery of section 11B, both-ends support of the sun gear S3 is carried out respectively through a bush in the second half of a shaft at section 11B in the gear section and extension stem section, and both-ends support of the sun gear S2 is carried out respectively through the bush at the extension stem section of a sun gear S3 in the gear section and extension stem section. The cantilevered suspension of the carrier C2 (C3) is carried out to the extension stem section of a sun gear S2 through a bush in the front end side, and a ring wheel R2 is spline connection through flange material, and is supported by the counter drive gear 19. And as for the sun gear S2 of the planetary-gear set G, the extension stem section is connected with the power transfer member 14 by spline engagement, and the power transfer member 14 is connected at the tip of a periphery side body of the drum 72 of the 3rd clutch (C-3) by end-face engagement. Moreover, as for the sun gear S3, the extension stem section is connected with the extension stem section of the cylinder 60 of the hydraulic servo of the 1st clutch (C-1) by spline engagement. And the carrier C2 (C3) is connected with the member which unified the hub 54 of the 2nd clutch and the hub of the 2nd brake (B-2) which are fixed to the back end and extend the periphery side of the planetary-gear set G toward the front, and the inner ball race of an one-way clutch (F-1). Furthermore, the ring wheel R2 is connected with the counter drive gear 19 through the connection member as mentioned above.

[0049] The moderation planetary gear G1 Before consisting of the back end sections of the sleeve shaft 13 which fitting immobilization is carried out at the inner circumference of an oil pump cover, and fixes the stator of a torque converter to an oil pump cover through an one-way clutch in the front end section, the sun gear S1 as a reaction force element is fixed to side boss section 10a by spline engagement. The ring wheel R1 as an input element is made to connect with the periphery of flange 11a of an input shaft 11 by spline engagement, and it is arranged among both the hydraulic servos 7 and 6 of these clutches in detail between the 3rd clutch (C-3) and the 1st clutch (C-1). And the carrier C1 as an output element is directly connected with the hub 74 common to the 1st and 3rd clutches which describe the front end side minutely later.

[0050] Next, the hydraulic servos 6 and 7 of the 1st and 3rd clutches (C-1, C-3) are arranged at the sense in which the cylinders 60 and 70 facing each other [6 and 7], i.e., hydraulic servos, carry out opening to the both sides on both sides of the moderation planetary gear G1 in order at the moderation planetary-gear G1 side. And the hydraulic servo 6 of the 1st clutch is supported by the back end section periphery of axial first portion 11A of an input shaft free [rotation] by supporter 62a, and consists of the cylinder 60 which had the drum 62 fixed to a periphery side, a piston 61 fitted in the cylinder 60 free [sliding], a cancellation plate 65 which offsets the centrifugal oil pressure concerning a piston 61, and a return spring 66. The feeding and discarding of servo ** to this hydraulic servo 6 are performed by free passage with the oilway prepared in the change gear case through oilway 11 within shaft p prepared in axial first portion 11A of an input shaft 11.

[0051] It is arranged at the inner circumference side of the friction member 63 of this clutch, and the sun gear S3 of the planetary-gear set G is made to carry out spline connection in the extension stem section, and let the cylinder 60 of this 1st clutch (C-1) be the member which transmits power to the sun gear S3 of the planetary-gear set G from the drum 62 of the 1st clutch. And spline connection of the drum 62 connected [it / a cylinder 60 and] is carried out with the extension stem section of a sun gear S3 by the inner circumference side of support 10C as supporter material of the counter drive gear 19 which transmits the output from the ring wheel R3 of the planetary-gear set G to the counter shaft 20.

[0052] By such configuration, in transfer, power from the 1st clutch (C-1) to the sun gear S3 of the planetary-gear set G can be performed without making the member according to rank for power transfer placed between shaft orientations using the cylinder 60 of the 1st clutch, and compaction of the axial length by it is made [power]. By moreover, the thing for which supporter 62a of the drum 62 through the hydraulic servo 6 of the 1st clutch is arranged to the inner circumference side of the width of face equivalent to the thickness of the power transfer member 14 and a cylinder 60 so that a substantial shaft-orientations tooth space may not be required. Even the shaft-orientations length corresponding to arrangement spacing of the seal ring which carries out the sealing device of the supply way of servo ** to this hydraulic servo on shaft-orientations both sides makes thin the shaft-orientations length of a hydraulic servo 6, and compaction of the axial length of a change gear style is made, supporting the clutch drum 62 certainly.

[0053] The hydraulic servo 7 of the 3rd clutch is supported by the periphery of before side boss section 10a free [rotation] through a bush by supporter 72a in the inner circumference side, and consists of the cylinder 70 which expanded the diameter of a periphery side and was used as the drum 72, a piston 71 fitted in the cylinder 70 free [sliding], a cancellation plate 75 which offsets the centrifugal oil pressure concerning a piston 71, and a return spring 76. The feeding and discarding of servo ** to this hydraulic servo 7 are directly performed from oilway 10 within case q formed in before side boss section 10a.

[0054] The friction member 63 of the 1st clutch (C-1) and the friction member 73 of the 3rd clutch (C-3) are put in order and arranged at the periphery side of the moderation planetary gear G1. And the friction member 63 of the 1st clutch (C-1) The back up plate which consisted of the friction material and separator plates of many plates which made the hub 74 carry out spline engagement of the inner circumference side, and made the drum 62 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 62. The clutch engagement actuation pinched at the piston 61 extruded by supply of the oil pressure into a hydraulic servo 6 from a cylinder 60 considers as the configuration which transmits torque to the drum 62 as an output side member from the hub 74 as input flank material.

[0055] The friction member 73 of the 3rd clutch (C-3) The back up plate which consisted of the friction material and separator plates of many plates which made the hub 74 carry out spline engagement of the inner circumference side, and made the drum 72 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 72. The clutch engagement actuation pinched at the piston 71 extruded by supply of the oil pressure into a hydraulic servo 7 from a cylinder 70 considers as the configuration which transmits torque to the drum 72 as an output side member from the hub 74 as input flank material.

[0056] Two clutches (C-1, C-3), the 1st which transmits the moderation torque outputted from the moderation planetary gear G1 to the planetary-gear set G, and the 3rd, thus, to the latest of the moderation planetary gear G1. Since it becomes the configuration surrounded by the friction members 63 and 73 by the side of the periphery of the moderation planetary gear G1, and the hydraulic servos 6 and 7 of order, only in and the interior which had the power transfer at both clutches (C-1, C-3) from the moderation planetary gear G1 surrounded. To the hub 74 common to both clutches, without allotting the member according to rank from a carrier C1. A direct deed, While passing through two clutches enables it to perform transfer in the planetary-gear set G of power through the 1st hydraulic servo 6. The number of the members which need the support to a shaft for power transfer, and are put on shaft orientations is reduced by the direct power transfer

at both clutches (C-1, C-3) from the moderation planetary gear G1, and the power transfer using the hydraulic servo 6 of the 1st clutch. Therefore, the axial length of a change gear style is shortened by this configuration, and compaction of the high torque-transmission member by it is also made. Moreover, the transfer path of moderation torque is concentration-ized, and since multiaxial structure which lets the shaft for power transfer pass to the inner circumference side of the planetary-gear set G by complication of the input path of the moderation torque to the planetary-gear set G and the input path of non-slown down torque is abolished, the light weight of a change gear and miniaturization are made.

[0057] Moreover, it is related with connection to the planetary gear G of the 1st clutch (C-1) which lets between the connection section mutual [these] accompanying division before and after an input shaft 11, and the peripheries of an input shaft 11 and counter drive gear inner circumference pass, and the 3rd clutch (C-3). Input-shaft first portion 11A and the second half The spline connection section of section 11B, the spline connection section of the extension stem section of a sun gear S3, and the extension stem section of a cylinder 60, And since the spline connection section of the extension stem section of a sun gear S2 and the power transfer member 14 is mutually shifted by shaft orientations, major-diameter-ization by the lap of the direction of a path of these three connection sections is prevented, and it has compact composition.

[0058] On the other hand, it is arranged after the planetary-gear set G at a side, i.e., the backmost part of a change gear style, an inner circumference side is connected with flange 11b of section 11B in the second half of an input shaft, and the hydraulic servo 5 of the 2nd clutch consists of the cylinder 50 which carried out diameter expansion extension of the periphery side, and was used as the drum 52, a piston 51 fitted in the cylinder 50, a cancellation plate 55 of centrifugal oil pressure, and a return spring 56. The feeding and discarding of the oil pressure of this hydraulic servo 6 are performed through 10t of oilways within a case formed in backside [a change gear case] boss section 10b.

[0059] The friction member 53 of the 2nd clutch (C-2) To the part which is the back by the side of the periphery of the planetary-gear set G, and does not have a ring wheel The back up plate which consisted of the friction material disks and separator plates of many plates which made the hub 54 carry out spline engagement of the inner circumference side, and made the drum 52 carry out spline engagement of the periphery side, and was fixed at the tip of a drum 52, It considers as the configuration which makes a drum 52 input flank material and transmits torque by using a hub 54 as an output side member by clutch engagement actuation pinched at the piston 51 extruded by supply of the oil pressure into a hydraulic servo 5 from a cylinder 50.

[0060] Thus, it is related with the 2nd clutch (C-2) and 2nd brake (B-2). It compares with the 1st and 3rd clutches by transmitting the torque which is not slowed down. The friction member 53 of the 2nd clutch (C-2) with a small torque capacity Major-diameter-size by arranging to the periphery side of the planetary-gear set G, and capacity is earned by the friction member side. Since it becomes the arrangement which put the hydraulic servo 9 of the 2nd brake (B-2) on the periphery side of the hydraulic servo 5 of the 2nd clutch which minor-diameter-ized only the part in the direction of a path, compaction of the further change gear axial length is made by arrangement of both the hydraulic servos that used the direction tooth space of a path effectively.

[0061] Next, the 1st brake (B-1) is used as a band brake, and the brake band 83 is considered as the configuration which binds the peripheral face of the drum 72 of the 3rd clutch (C-3) tight as an engagement side. By this, the 1st brake (B-1) will not require a shaft-orientations tooth space, but will be arranged, without moreover making most direction dimensions of a path increase. In addition, the hydraulic servo of this band brake is the same shaft-orientations location as a brake band 83, and since it is what is prolonged in a tangential direction to a drum 72, it is omitting illustration. Thus, the clutch drum 72 which supports the friction member 73 of the 3rd clutch arranged at the periphery side of moderation PURANERARIGIYA G1 is used as the drum of the 1st brake. And since supporter 72a of this drum has been arranged in the location which laps with the sun gear S1 of the moderation planetary gear G1, both the direction tooth space of a path for brake drum arrangement and the shaft-orientations tooth spaces for drum support are reduced, and the outer diameter of a change gear style and compaction of axial length are made. And the stable brake performance can be obtained, using a clutch drum, since it becomes the configuration which supported the drum concluded in a band 83 to before [a case] side boss section 10a by the inner circumference side of the conclusion section.

[0062] The 2nd brake (B-2) is considered as a multi-plate configuration like each clutch. The friction member 93 It is arranged ahead by the side of the periphery of the planetary-gear set G. The hydraulic servo 9 of the 2nd brake It is arranged at back end wall 10e of the case 10 by the side of the periphery of the hydraulic servo 5 of the 2nd clutch, and press of the friction member 93 of the 2nd brake is enabled through

the periphery side of the friction member 53 of the 2nd clutch, and it compares with an one-way clutch (F-1), and is arranged. And the hydraulic servo 9 of the 2nd brake (B-2) is formed with the gestalt which made the piston 91 fit in back end wall 10e of the change gear case 10, and made the cylinder build in it. Furthermore, in detail, baffle support of the separator plate of the friction member 93 is carried out by spline engagement in those periphery side at 10f of peripheral wall sections of a case 10, and baffle support of the friction material disk is carried out by spline engagement in those inner circumference side in the clutch hub 54 and the brake hub of one. Moreover, a hydraulic servo 9 is considered as the configuration which fitted the annular piston 91 in the cylinder demarcated by 10f of peripheral wall sections of a case 10, back end wall 10e, and annular wall 10e' prolonged in shaft orientations from back end wall 10e, and the extension of a piston 91 is considered as the arrangement which stands face to face against the friction member 93 through the periphery of the drum 52 of the 2nd clutch. the -- two -- a brake (B-2) -- a hydraulic servo -- nine -- a return spring -- 96 -- the -- a receptacle -- the section -- 96 -- ' -- the -- two -- a brake (B-2) -- friction -- a member -- 93 -- supporting -- a spline -- ten -- f -- a crevice -- ten -- g -- ' -- arranging -- having -
- ****

[0063] Thus, by arranging the return spring 96 and receptacle section 96' of the hydraulic servo 9 of the 2nd brake to 10g [of spline 10g / of a case 10 / crevices], about the return spring 96, arrangement which does not require an arrangement-on parenchyma tooth space can be realized, and, only in the part, the case outer diameter of a change gear is small.

[0064] Next, about support of the counter drive gear 19, this gear 19 is supported by the periphery of 10h of boss sections prolonged back through bearing 12 in the inner circumference of support 10C which constitutes the supporter material. This support 10C carries out the bolt stop of the periphery side to the end face of the heights of the spline in the level difference section of case body 10B which expands the diameter of pars intermedia a little mostly, and is formed, and is being fixed to case body 10B so that it may understand with reference to drawing 5 .

[0065] To the input shaft 11 with which the change gear style has been arranged as mentioned above, in the front end section of the counter shaft 20, the differential-gear drive pinion gear 22 which gears in piles to shaft orientations at the differential-gear ring wheel 31 of differential equipment 3 is arranged with the gestalt which cuts and lacks a part of oil pump body at front end wall 10A so that it may understand with reference to drawing 5 . The before [the counter shaft 20] side is supported by case body 10B through bearing with arrangement of the differential-gear drive pinion gear 22 to this foremost part behind the differential-gear drive pinion gear 22. And from this physical relationship, the hydraulic servo 7 of the 3rd clutch (C-3) is arranged in the location which lapped in the differential-gear ring wheel 31 and the direction of a path, and the friction member 73 of the 3rd clutch is considered as the arrangement which lapped with the differential-gear ring wheel 31 and shaft orientations in part on the periphery of moderation PURANERARIGIYA G1.

[0066] Such arrangement is arranging the differential-gear drive pinion gear 22 ahead as much as possible. The lap of the direction of a path of the differential-gear ring wheel 31 and the friction member 73 of the 3rd clutch is abolished. It is useful to losing constraint of the direction dimension of a path of the friction member 73, and securing capacity, and by interference with the differential-gear ring wheel 31 by compaction of a wheel base, or expansion of the diameter of a gear, even if the hydraulic servo 7 of the 3rd clutch minor-diameter-izes, it makes it possible to obtain sufficient clutch capacity. Therefore, by this configuration, when taking a fixed wheel base between an input shaft 10 and the differential-gear shaft 30, it is useful to increasing the degree of freedom of a differential-gear ratio setup by enlarging width of face of selection of the diameter of a differential-gear ring wheel, or compaction of a wheel base is also made easy. [0067] Next, drawing 8 shows the 2nd operation gestalt which transferred only the counter drive gear 19 to the backmost part of a change gear in the cross section [-izing / the cross section / the ** type] in the same element arrangement of each as the 1st operation gestalt and parenchyma. In the case of this gestalt, the hydraulic servo 5 of the 2nd clutch is supported by the periphery of section 11B in the second half of an input shaft, and, instead, the counter drive gear 19 is supported by backside [the 2nd] boss section 10b' of the major diameter of case body 10B. Moreover, the hydraulic servo 9 of the 2nd brake is arranged considering the level difference section of case body 10B as a cylinder.

[0068] With this 2nd operation gestalt, since the hydraulic servo 5 of the 2nd clutch is supported by the periphery of section 11B in the second half of an input shaft, the configuration of the oilway within a shaft of an input shaft 11 is changed for supply of servo ** to a hydraulic servo 5. The oilway within a shaft of section 11B is divided forward and backward in the second half of an input shaft. Namely, about oilway 11swithin shaft' by the side of before In before side boss section 10a, it connects with the oilway within a

gear change case like the case of the 1st operation gestalt, and connects with 10t of oilways within a case for the servo pressure supply prepared in the back end wall 10e side of change gear case body 10B about oilway 11s within shaft" on the backside. And between the periphery of section 11B, and backside boss section 10b, seal ring 11u for the sealing devices of servo ** is arranged in the second half of an input shaft.

[0069] The advantage by this 2nd operation gestalt is applied to the point which the axial length by abolition of support 10C can shorten. It is in the point which can connect the output side of the 1st and 3rd clutches (C-1, C-3) with both the elements S2 and S3 of the direct planetary-gear set G. Thereby, the 1st and 3rd clutches (C-1, C-3) can make the shortest not only the high torque-transmission path of the input side but the high torque-transmission path of an output side. Moreover, with this gestalt, there is also an advantage out of which it comes by reducing the diameter of the back end section periphery of case body 10B according to the outer diameter of the counter drive gear 19 to minor-diameter-ize the gear change back end section, and the loading nature of a change gear can be raised as compared with axial length by this minor-diameter-izing especially the back end section that is easy to produce interference with the car side member at the time of car loading. By furthermore, the configuration which is made to carry out opening of 11s [of oilways within a shaft on the backside / section 11B]" to an axis end in the second half of an input shaft, and is connected to 10t of oilways within a case inside backside boss section 10b As compared with needing the **** seal ring of a pair when connecting an oilway by ****, before and after inserting an oilway connection, the advantage which can suppress the increment in the number of seal rings accompanying performing supply of servo ** to the hydraulic servo 5 of the 2nd clutch through an input shaft to the minimum is also acquired.

[0070] Drawing 9 shows similarly the 3rd operation gestalt which arranged the counter drive gear 19 between the planetary-gear set G and the 2nd clutch (C-2) in the cross section [-izing / the cross section / the ** type] in the same element arrangement of each as the 1st operation gestalt and parenchyma. In the case of this gestalt, the counter drive gear 19 is supported by 10h of boss sections ahead prolonged from support 10C fixed to 10f of peripheral walls of case body 10B. It follows on this. In the relation between the planetary-gear set G and the 2nd clutch (C-2) Since the counter drive gear 19 will be located among both, the hub 54 of the 2nd clutch is ahead extended in accordance with an input shaft 11. Similarly the axial supporter of the carrier C2 (C3) of the planetary-gear set G is back extended in accordance with an input shaft 11, and it considers as the configuration which carries out spline engagement connection of both shaft-orientations extensions by the inner circumference side of support 10C which supports the counter drive gear 19. Moreover, about the hydraulic servo 9 of a brake (B-2), it considers as a configuration equipped with the original cylinder 90 fixed to 10f of peripheral walls of case body 10B. In addition, although the location of a brake (B-2) and an one-way clutch (F-1) is reversed in this case, this is transferring the ring wheel R2 of the planetary-gear set G to the periphery side of the sun gear S3 of a minor diameter, and is for securing servo capacity by arranging a cylinder 90 into the part which lacks a ring wheel on a periphery.

[0071] The advantage by this 3rd operation gestalt is locating the 2nd small clutch (C-2) of a torque load in the backmost part, and since it serves as arrangement which packs each element of a high torque load and is brought near ahead relatively, it is in the point that the rigid maintenance as the whole change gear becomes easy. Moreover, since the relation of hydraulic pressure supply can follow the configuration of the 1st operation gestalt, it becomes advantageous in respect of mitigation of the sliding friction by the seal ring to the 2nd operation gestalt.

[0072] Next, drawing 10 shows the 4th operation gestalt which arranged the 2nd clutch (C-2) between the planetary-gear set G and the 1st clutch (C-1) in the cross section [-izing / the cross section / the ** type] in what has arranged the counter drive gear 19 at the backmost part like the 2nd operation gestalt. In the case of this gestalt, unlike each old operation gestalt, rotation of section 11B to mutual is enabled input-shaft first portion 11A and the second half, and the front end of section 11B is supported by first portion 11A through bearing in the second half of an input shaft. And the hydraulic servo 5 of the 2nd clutch (C-2) is arranged in the periphery of the back end section of input-shaft first portion 11A. By being fixed to it with the periphery of input-shaft first portion 11A, the cylinder 50 of a hydraulic servo 5 consists of a cylinder 60 of the 1st clutch, and a tabular member of a similar cross-section configuration, is connected with the periphery side of a cylinder 50, and the clutch drum 52 is formed. The piston 51 of a hydraulic servo 5 is also made into the same cross-section configuration as the piston 61 of the 1st clutch. The clutch hub 54 which engages with the inner circumference side of the friction member 53 is connected with the front end side of section 11B in the second half of an input shaft. Moreover, the carrier C2 of the planetary-gear set G is connected with the back end side of section 11B in the second half of an input shaft. Moreover, the oilway within a shaft for the servo pressure supply of the 2nd clutch is formed in oilway 11 within shaft p for the servo pressure supply of

the 1st clutch, and juxtaposition as oilway 11 within shaft p' of input-shaft first portion 11A.

[0073] Since the advantage by this gestalt becomes expandable [the projected net area to the bore direction] and the output side member of the 1st and 3rd clutches only passes along it also about the outer-diameter direction by **** arrangement of that hydraulic servo 5 about the 2nd clutch (C-2), it is in the point that constraint of the shape of a dimension is eased. Therefore, with this gestalt, miniaturization of a shaft-orientations dimension is attained about the 2nd whole clutch by earning the capacity of that hydraulic servo 5 by expansion to the bore direction, and reducing configuration number of sheets by major-diameter-ization of the friction member 53 about the 2nd clutch (C-2) whose torque-transmission capacity may originally be small. Thereby, by contrast with other precedence implementation gestalten shown by the same-on drawing ratio, remarkable axial length compaction of a change gear accomplishes so that clearly.

[0074] By the way, with each above-mentioned gestalt, although the moderation planetary gear G1 (henceforth [these 3 person is named generically and] a high torque-transmission system) are arranged in the 1st and 3rd clutch (C-1, C-3) lists at the connection side with the engine in a change gear, these can also be arranged to the back end side of a change gear with-related [the same configuration and connection-related / same]. Drawing 11 shows the 5th operation gestalt which takes such a configuration in the cross section [-izing / the cross section / the ** type]. With this gestalt, arrangement of the planetary-gear set G, the moderation planetary gear G1, three clutches (C-1 to C-3), and the counter drive gear 19 is completely made into the reverse sense to the 1st operation gestalt.

[0075] When taking such arrangement, after the sun gear S1 of the moderation planetary gear G1 is prolonged from case body 10B, it is fixed to side boss section 10b, the hydraulic servo 7 of the 3rd clutch is also supported by backside boss section 10b, and the hydraulic servo 6 of the 1st clutch is supported by section 11B in the second half of an input shaft. Moreover, the hydraulic servo 5 of the 2nd clutch is supported by before side boss section 10a. Furthermore, the hydraulic servo 9 of the 2nd brake is considered as a configuration with the original cylinder 90 fixed to 10f of case body peripheral walls. Moreover, about the oilway within a shaft, the thing in axial first portion 11A is simplified by one lubricating oil way.

[0076] Since the 2nd clutch (C-2) which whose torque-transmission capacity is [the advantage of this 5th operation gestalt] small in order not to participate in transfer of moderation torque, and can make the outer diameter of the friction member 53 small by that cause serves as relation located in the method of the forefront, It is in the point whose degree of freedom of a setup of the wheel base (a setup of differential-gear gear ratio is influenced) of the main shaft X and the differential-gear shaft Z of the clutch friction member 53 and the differential-gear ring wheel 31 which constraint of interference is eased and are shown in drawing 1 increases.

[0077] When this point is explained further in full detail, the clutch (C-2) which carries out the direct input of the rotation of an input shaft 11 to a carrier C2 (C3) is a clutch which is not engaged at the time of the advance 1st speed (1ST) - the 3rd speed (3RD), and go-astern (REV) so that clearly from explanation of a previous gear ratio. Therefore, this clutch (C-2) does not pay the magnification torque by moderation so that the urinal stall torque which amplified the engine torque from a torque converter 4 like [at the time of a car halt] may not be received and it may understand with reference to the velocity diagram of drawing 4 by contrast with other two clutches (C-1, C-3). Therefore, this clutch (C-2) can be used as a clutch with a small torque capacity (this capacity is decided by the number of sheets of the diameter of a clutch, and a friction member) as compared with other clutches. Therefore, only the part which made the diameter of a clutch small can enlarge the diameter of a gear of the differential-gear ring wheel 31 to the wheel base of a main shaft X and the differential-gear shaft Z by making this diameter of a clutch small from the axial physical relationship shown in drawing 2 .

[0078] Next, also in the configuration which arranges a high torque-transmission system to the back end side of a change gear as mentioned above, modification of the element location of the same complementary of the as said each operation gestalt is possible. Drawing 12 shows the 6th operation gestalt which has arranged the counter drive gear 19 between the planetary-gear set G and the 2nd clutch (C-2) in the cross section [-izing / the cross section / the ** type]. In the case of this gestalt, from the counter drive gear 19 being located in the sun gear S3 side of a minor diameter to the planetary-gear set G From the reason connection-related [the / as the case of the above-mentioned 3rd operation gestalt / same], the ring wheel R3 of the planetary-gear set G was arranged in the sun gear S3 side of a major diameter, and has reversed the physical relationship of the 2nd brake (B-2) and an one-way clutch (F-1) to the 5th operation gestalt in connection with it.

[0079] In the case of this 6th operation gestalt, the advantage to which only the part by which the transfer path of moderation torque does not pass along the inner circumference of support wall 10C becomes short is

acquired from the above-mentioned 5th operation gestalt. Moreover, since the counter drive gear 19 approaches the differential-gear drive pinion gear 22 (refer to drawing 1), lightweight-ization of it by compaction of the axial length of the counter shaft 20 which supports the counter driven gear 21 and the differential-gear drive pinion gear 22 is attained.

[0080] Next, drawing 13 shows the 7th operation gestalt which replaced the location of the counter drive gear 19 with the 2nd clutch (C-2) to the 6th operation gestalt in the cross section [-izing / the cross section / the ** type]. In the case of this gestalt, the counter drive gear 19 is directly supported by before [a change gear case] side boss section 10a, and the hydraulic servo 5 of the 2nd clutch (C-2) is supported by the periphery of input-shaft front half 11A. And since the oilway within a shaft for the servo pressure supply of the 2nd clutch (C-2) and the oilway within a shaft for lubrication pressure supply especially stand in a row by the part by the side of before the axial first portion with this gestalt, axial first portion 11A is considered as the configuration which unified two members from on [of processing] expedient. Thus, the configuration which arranges the counter drive gear 19 at the foremost part of a change gear style is suitable for the transformer axle of a format which does not perform moderation with the 2nd shaft by setting an idler shaft as the 2nd shaft Y shown in drawing 1 .

[0081] In order that the advantage by this operation gestalt may support the counter drive gear 19 by case front end wall 10A, It is not necessary to prepare a support in case body 10B, and compares with the 2nd and 4th operation gestalt shown in drawing 8 and drawing 10 which moreover take the supporting structure to the same case. In order to mean putting the counter drive gear 19 which produces a gear noise on the innermost part of the change gear by which noise radiation cannot be carried out easily, it becomes advantageous in respect of reduction of a gear noise.

[0082] Next, drawing 14 shows said 4th operation gestalt and the 8th operation gestalt which applied the same view to the configuration which arranges a high torque-transmission system to the back end side of a change gear in the cross section [-izing / the cross section / the ** type]. With this gestalt, all arrangement is reversed to the 4th operation gestalt. It is suitable for the transformer axle of the format which sets an idler shaft as the 2nd shaft Y like [this arrangement] the above-mentioned 7th operation gestalt. And especially in the case of this gestalt, the planetary-gear set G which is the amount element of Oshige, and the counter drive gear 19 serve as arrangement excellent in ** by which intensive arrangement will be carried out at a before side, and the point which raises the rigidity of a change gear.

[0083] Next, drawing 15 shows the 9th operation gestalt which replaced the location of the counter drive gear 19 with the planetary-gear set G to the above-mentioned 8th operation gestalt in the cross section [-izing / the cross section / the ** type]. In the case of this gestalt, the counter drive gear 19 is supported by support 10C by the same approach as said 5th operation gestalt, and the hydraulic servo 9 of the 2nd brake (B-2) is built in front end wall 10A of a change gear case. The planetary-gear set G this the arrangement of whose is also the amount element of Oshige, and the counter drive gear 19 serve as arrangement excellent in ** by which intensive arrangement will be carried out at a before side, and the point which raises the rigidity of a change gear.

[0084] Although each above operation gestalt illustrates application to the transformer axle of this invention, this invention is applicable also to the vertical-type change gear for front engine Riyadh live (FR) vehicles. Drawing 16 - drawing 19 show the 10th operation gestalt as such instantiation. Although the change gear style in this gestalt is the same as that of said each gestalt, essentially, it has two differences accompanying having made it vertical. Since constraint of axial length is loose compared with the case of a horizontal type, the 1st [the] is a gear change transient especially the one-way clutch which has the same semantics as the juxtaposition of an one-way clutch (F-1) to the 2nd brake (B-2) in a precedence implementation gestalt that it should hold and the oil pressure control at the time of substitute gear change should be simplified, and the point of having established the combination of a brake to the 1st brake (B-1). And the 2nd is a point which has connected the ring wheel R2 as an output element with the input shaft 11 and the output shaft of the same axle.

[0085] Since the name of the 2nd brake and an one-way clutch has shifted to each precedence gestalt with addition of such a component, redundancy is the semantics which avoids derangement although it becomes, and it explains anew from a gear train configuration.

[0086] Drawing 16 shows the gear train of the 10th operation gestalt by the skeleton. With reference to drawing 16 , the configuration by which the torque converter 4 with a lock-up clutch connected with the engine which is not illustrated at the foremost part of that device has been arranged, and the change gear style which attains advance 6 ** and the go-astern 1st speed at that posterior part has been arranged is taken with this automatic transmission. A torque converter 4 is equipped with the pump impeller 41, the turbine

runner 42, the stator 43 arranged among them, the one-way clutch 44 which makes the change gear case 10 carry out one direction rotation engagement of the stator 43, and the stator shaft 45 which fixes the inner ball race of an one-way clutch to the change gear case 10.

[0087] The planetary-gear set G which forms the subject of a change gear style The sun gears S2 and S3 of a pair with which the diameters of size differ like each previous operation gestalt, While gearing mutually and one side's gearing to the sun gear S2 of a major diameter, it gears to a ring wheel R3, and it consists of RABINIYO-type gear sets by which another side consists of a carrier C2 (C3) which supports the pinion gears P2 and P3 of a pair which gear to the sun gear S3 of a minor diameter.

[0088] Moreover, it is similarly constituted from simple planetary gear by the moderation planetary gear G1. While the ring wheel R1 as the input element is connected with an input shaft 11 and the carrier C1 as an output element is connected with the minor diameter sun gear S3 through the 1st clutch (C-1) It connects with the sun gear S2 of a major diameter through the 3rd clutch (C-3), and the sun gear S1 as a fixed element which takes reaction force is fixed to the change gear case 10.

[0089] The relation between engagement and release of each clutch in the case of this automatic transmission, a brake, and an one-way clutch, and the gear ratio attained comes to be shown in the engagement graph of drawing 17. In O mark in an engagement table, engagement and the-less mark express the engagement to which release and ** mark do not carry out the direct action of the engagement only at the time of engine brake, and the - mark to achievement of a gear ratio. Moreover, drawing 18 shows the relation between the gear ratio attained by engagement (those engagement is expressed with - mark) of each clutch and a brake, and the rotational frequency ratio of each gear change element at that time with a velocity diagram.

[0090] The 1st ** (1ST) is engagement (in this gestalt, although it replaces with engagement of this brake (B-3) and automatic engagement of an one-way clutch (F-2) is used so that it may understand with reference to an actuation table) of a clutch (C-1) and a brake (B-3) so that both drawings may be combined and referred to and may be known. it is as those names only differing and having explained why the reason for using this engagement and this engagement are equivalent to engagement of a brake (B-3) in the previous operation gestalt with the relation between a brake (B-2) and an one-way clutch (F-1). It is attained. In this case, reaction force is taken on the carrier C3 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of an one-way clutch (F-2), and moderation rotation of the maximum reduction gear ratio of a ring wheel R3 is outputted to output-shaft 19A.

[0091] Next, the 2nd ** (2ND) is attained by engagement (why these engagement is equivalent to engagement of a brake (B-1) is explained in full detail behind.) of the brake (B-2) which confirms engagement and it of a clutch (C-1) and the one-way clutch (F-1) equivalent to engagement of a brake (B-1). In this case, reaction force is taken to the major-diameter sun gear S2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the minor diameter sun gear S3 via the clutch (C-1), and was stopped by engagement of a brake (B-2) and an one-way clutch (F-1), and moderation rotation of a ring wheel R3 is outputted to output-shaft 19A. The reduction gear ratio at this time becomes smaller than the 1st ** (1ST) so that it may see to drawing 18.

[0092] Moreover, the 3rd ** (3RD) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-3). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 is inputted into the major-diameter sun gear S2 and the minor diameter sun gear S3 via a clutch (C-1) and a clutch (C-3) at coincidence. Since the planetary-gear set G will be in a direct connection condition, rotation of the same ring wheel R3 as the input rotation to both sun gears is outputted to output-shaft 19A as rotation slowed down to rotation of an input shaft 11.

[0093] Furthermore, the 4th ** (4TH) is attained by coincidence engagement of a clutch (C-1) and a clutch (C-2). In this case, the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side is inputted into a sun gear S3 via a clutch (C-1). The non-slowng down rotation inputted via the clutch (C-2) from the input shaft 11 on the other hand is inputted into a carrier C3, and middle rotation of two input rotations is outputted to output-shaft 19A as rotation of the ring wheel R3 slightly slowed down to rotation of an input shaft 11.

[0094] Next, the 5th ** (5TH) is attained by coincidence engagement of a clutch (C-2) and a clutch (C-3). In this case, the rotation which the non-slowng down rotation as which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 by one side was inputted into the sun gear S2 via the clutch (C-3), and was inputted via the clutch (C-2) from the input shaft 11 on the other hand was inputted into the carrier C2, and accelerated it more slightly than rotation of the input shaft 11 of a ring wheel R3 is

outputted to output-shaft 19A.

[0095] And the 6th ** (6TH) is attained by engagement of a clutch (C-2) and a brake (B-1). In this case, non-slowng down rotation is inputted only into a carrier C2 via a clutch (C-2) from an input shaft 11, reaction force is taken to the sun gear S2 stopped by engagement of a brake (B-1), and the rotation which accelerated the ring wheel R3 further is outputted to output-shaft 19A.

[0096] In addition, go-astern (REV) is attained by engagement of a clutch (C-3) and a brake (B-3). In this case, reaction force is taken on the carrier C2 with which the rotation slowed down through the moderation planetary gear G1 from the input shaft 11 was inputted into the sun gear S2 via the clutch (C-3), and was stopped by engagement of a brake (B-3), and the inversion of a ring wheel R3 is outputted to output-shaft 19A.

[0097] Here, the relation of the one-way clutch (F-1) and both the brakes (B-1, B-2) which touched previously is explained. In this case, an one-way clutch (F-1) can be made to demonstrate a function equivalent to engagement of a parenthesis top brake (B-1) by considering as a setup which doubled the engagement direction of the one-way clutch (F-1) connected with the sun gear S2 in the reaction force torque support direction at the time of the 2nd ** of a sun gear S2. However, since unlike a carrier C2 (C3) this sun gear S2 is not only engaged in order to acquire the engine brake effectiveness at the time of the 2nd **, but is a gear change element stopped also for the 6th *****, a brake (B-1) is needed. Moreover, although a sun gear S2 rotates to hard flow to an input hand of cut at the time of the 1st ** (1ST) achievement so that it may understand also with the velocity diagram of drawing 18, in the case of the gear ratio of the 3rd more than **, it rotates in the same direction as an input hand of cut. Therefore, since an one-way clutch (F-1) cannot be connected with a direct holddown member, it is considering effectiveness of an engagement condition as the controllable configuration by serial arrangement with a brake (B-2).

[0098] Thus, each gear ratio attained serves as a good rate step at equal intervals comparatively to each gear ratio so that it may understand qualitatively on the velocity diagram of drawing 18 with reference to spacing of the vertical direction of O mark which shows the velocity ratio of ring wheels R3 and R2. If a numeric value is set up and this relation is expressed quantitatively concretely, it will become a step between the gear ratio shown in drawing 17. The gear ratio in this case is the case where it is set as gear ratio $\lambda_3=0.375$ of the sun gear S1 of the moderation planetary gear G1, the sun gear S2 by the side of gear ratio $\lambda_1=0.556$ of a ring wheel R1, and the major-diameter sun gear of the planetary-gear set G, the sun gear S3 by the side of gear ratio $\lambda_2=0.458$ of a ring wheel R2 (R3), and a minor diameter sun gear, and a ring wheel R3, and gear ratio width of face is set to 6.049.

[0099] Next, drawing 19 shows the configuration of an automatic transmission further to a detail in a cross section. Although the same reference mark is attached and being replaced with explanation about each component previously explained with reference to the skeleton, the details which cannot be referred to from a skeleton are explained below. First, with this gestalt, although the input shaft 11 is divided into section 11B in axial first portion 11A and the second half of a shaft mainly for the facilities on processing, it is considered as the configuration which was made to carry out fitting closely and was made to unify on parenthesis by a spline etc. mutually. The front end section by which the input shaft 11 was minor-diameter-ized is connected with the turbine runner 42 of a torque converter 4, and is supported by before [front end wall 10A by which the pars intermedia of a major diameter is constituted from an oil pump cover of the change gear case 10 through the stator shaft 45] side boss section 10a free [rotation]. The back end section by which section 11B was minor-diameter-ized in the second half of an input shaft is fitted in crevice 19a of output-shaft 19A, and is supported by back end wall 10e of the change gear case 10 free [rotation] through output-shaft 19A. The input section to the moderation planetary gear G1 is used as the flange of input-shaft first portion 11A, and is connected with the ring wheel R1.

[0100] Oilway 11 within shaft p for the line pressure supply connected with the oilway within a case formed in before side boss section 10a and oilway 11 within shaft r for lubrication pressure supply are formed in this input-shaft first portion 11A, it closes and the shaft-orientations edge of oilway 11 within shaft p is open for free passage to the hydraulic servo 6 of the 1st clutch with the direction oilway of a path. Moreover, the shaft-orientations edge of oilway 11 within shaft r for lubrication pressure supply is opened wide, and is open for free passage to 11s of oilways within a shaft for the lubrication pressure supply formed in section 11B in the second half of an input shaft. Termination of the 11s of the oilways within a shaft for the lubrication pressure supply of second half section of input shaft 11B is carried out near the back end section of a shaft, and they are separated with 11t of oilways within a shaft for the line pressure supply formed in the back end side of a shaft.

[0101] Next, output-shaft 19A is supported by back end wall 10e of the change gear case 10 free [rotation]

through a roller bearing in the front end section, and the backmost part of the change gear case 10 supports the back end section free [rotation] through ball BEARIGU. The connection section to the output element of the planetary-gear set G is used as the flange of section 11B in the second half of an input shaft, and is connected with the ring wheel R3 through the drum-like member.

[0102] The oilway within a shaft for [which leads to the oilway within a case of the posterior part of the change gear case 10] line pressure supply is formed in this output-shaft 19A of said crevice 19a, and the oilway within this shaft is open for free passage to the hydraulic servo 5 of the 2nd clutch (C-2) through 11t of oilways within a shaft formed in the back end section of section 11B in the second half of an input shaft in which it was fitted in crevice 19a.

[0103] the planetary-gear set G -- ***** of second half section of input shaft 11B -- it is arranged mostly at the periphery side of a central part, and a sun gear S3 is supported by the periphery of second half section of input shaft 11B free [rotation], and is further supported free [rotation of a sun gear S2] at the periphery. The carriers C2 and C3 which support pinions P2 and P3 are unified, the front end section is supported by the sun gear S2 free [rotation], and the back end section is supported by second half section of input shaft 11B free [rotation].

[0104] the moderation planetary gear G1 -- ***** of the major diameter of input-shaft first portion 11A -- it is arranged mostly on a periphery at a mid gear, and the sun gear S1 is being fixed to the back end of the stator shaft 45 as before [the change gear case 10] side boss section 10a by spline fitting. Before the carrier C1 of the moderation planetary gear G1 consists of oil pump covers, support-at-one-end support of it is carried out at the periphery of side boss section 10a.

[0105] The 1st clutch (C-1) is supported by the periphery of input-shaft first portion 11A free [rotation] in the inner circumference section of the cylinder 60, and is connected with the carrier C1 of the moderation planetary gear G1 through the hub 74 of the 3rd clutch (C-3). Engagement support of the friction member 63 which consists of the friction material and separator plate of many plates of a clutch (C-1) is carried out in a separator plate at the inner circumference of a drum 62, engagement support of the inner circumference of friction material is carried out at the periphery of a hub 64, it is arranged between a drum 62 and a hub 64, and the inner circumference of a hub 64 is connected with the sun gear S3. The hydraulic servo 6 of a clutch (C-1) uses the inside of a drum 62 as a cylinder 60, and is considered as the configuration equipped with the return spring arranged between the piston 61 fitted in it free [shaft-orientations sliding], the cancellation plate by which the shaft-orientations stop was carried out to the inner circumference section of a drum 62, and a piston 61 and a cancellation plate.

[0106] While the drum 72 is connected with the inner ball race of an one-way clutch (F-1), the front end section is supported by before [the change gear case 10] side boss section 10a free [rotation], and connection support of the 3rd clutch (C-3) is carried out through the drum-like power transfer member at the sun gear S2 in the back end section. Engagement support of the friction member 73 which consists of the friction material and separator plate of many plates of a clutch (C-3) is carried out in a separator plate at the inner circumference of a drum 72, engagement support of the inner circumference of friction material is carried out at the periphery of a hub 74, it is arranged between a drum 72 and a hub 74, and the back end of a hub 74 is being fixed to the drum 62 of the 1st clutch (C-1). The hydraulic servo 7 of a clutch (C-3) is considered as the configuration equipped with the return spring arranged between a drum 72, the cylinder 70 of one, the piston 71 fitted in it free [shaft-orientations sliding], the cancellation plate by which the shaft-orientations stop was carried out to the inner circumference section of a cylinder 70, and a piston 71 and a cancellation plate.

[0107] The back end section of the drum 52 is fixed to the flange of section 10B in the second half of an input shaft, and the 2nd clutch (C-2) is supported by the cantilever condition. Engagement support of the separator plate is carried out at the inner circumference of a drum 52, engagement support of the inner circumference of friction material is carried out at the periphery of a hub 54, and the friction member 53 which consists of the friction material and separator plate of many plates of a clutch (C-2) is arranged between a drum 52 and a hub 54, and the front end of a hub 54 is fixed to the carrier C3 of the planetary-gear set G, and it is supported by the cantilever condition. The periphery of an input shaft 11 is united with a drum 52 as a part of cylinder 50, and the hydraulic servo 5 of a clutch (C-2) is considered as the configuration equipped with the return spring arranged between the piston 51 fitted in it free [shaft-orientations sliding], the cancellation plate by which the shaft-orientations stop was carried out to section 11B in the second half of an input shaft, and a piston 51 and a cancellation plate.

[0108] Let the 1st brake (B-1) be a band brake equipped with the band 83 which engages with the periphery of the drum 72 of the 3rd clutch (C-3). In addition, illustration is omitted about the hydraulic servo of this

brake.

[0109] The 2nd brake (B-3) is used as the multiple disc brake which uses the friction material and separator plate of many plates as the friction member 93, stop support of the separator plate is carried out at change gear case inner circumference, and engagement support of it is carried out in the hub 94 where friction material was fixed to the carrier C2. The hydraulic servo 9 of a brake (B-3) uses back end wall 10e of change gear case body 10B as a cylinder, and is considered as the configuration equipped with the piston 91 fitted in it free [sliding], and the return spring which a shaft-orientations stop is carried out to the back end wall of a change gear case, and contacts a piston 91. The extension which is extended along with 10f of peripheral walls of the case of a piston 91, and results in the back end of the friction member 93 carries out fitting of the periphery to spline of 10f of case peripheral walls 10g, and the baffle is carried out.

[0110] The polymerization of the friction member 93 of this brake (B-3) is made to carry out in the direction of a path to the periphery side of the sun gear S2 of the major diameter of the planetary-gear set G, and it is arranged.

[0111] Moreover, the inner ball race is fixed to the cylinder 70 of the 3rd clutch (C-3), and an one-way clutch (F-1) is considered as the configuration united with the hub of a brake (B-2) in an outer race, and is arranged in the front of the 3rd clutch (C-3), i.e., the foremost part of a change gear style. Let the brake (B-2) which stops an outer race in the change gear case 10 be the brake of the multi-plate configuration which uses as a friction member the separator plate by which engagement support was carried out at the outer race at the friction material by which engagement support was carried out, and the inner circumference spline of a change gear case. The hydraulic servo of a brake (B-2) uses front end wall 10A of the change gear case 10 as a cylinder, and is considered as the configuration equipped with the piston fitted in it free [sliding], and the return spring which a shaft-orientations stop is carried out to the front end wall of the change gear case 10, and contacts a piston.

[0112] And carry out spline association of the inner ball race at the front end section of a carrier C2, and an one-way clutch (F-2) makes an outer race engage with spline 10g of change gear case inner circumference, and is arranged in the shaft-orientations location between the friction member 63 of the 1st clutch (C-1), and the planetary-gear set G.

[0113] In the case of this 10th operation gestalt, as mentioned above the hydraulic servo 6 of the 1st clutch (C-1) The cylinder 60 is arranged towards the sense which carries out opening to the moderation planetary gear G1 in an opposite direction. Since the configuration in which it was connected [drum / 62 / of the 1st clutch / clutch] by the periphery side, and this clutch drum 62 was connected with the carrier C1 of the moderation planetary gear G1 is taken, Without giving a high torque load to the hydraulic servo 6 connected [side / of a drum 62 / inner circumference] not only about the 3rd clutch (C-3) but about the 1st clutch (C-1) by the transfer of high torque to a drum 62 from KURATCHIBABU 64 In order that the torque transmission by the side of a periphery may accomplish, the thinning of the cylinder 60 of the hydraulic servo 6 by the side of inner circumference becomes possible, and this becomes the light weight of a change gear, and miniaturizable.

[0114] And also in this gestalt, the 3rd clutch (C-3) is arranged ahead of the moderation planetary gear G1. Before the cylinder 70 which forms the hydraulic servo 7 of the clutch is prolonged from change gear front end wall 10A, it is supported by side boss section 10a. The supply way of the oil pressure to the hydraulic servo 7 is formed in before side boss section 10a. The moderation planetary gear G1 Since it is considering as the structure which fixes the sun gear S1 to before side boss section 10a, connects a ring wheel R1 with an input shaft 11 behind the moderation planetary gear G1, and takes out the output from a carrier C1 ahead of moderation planetary G1 By using before side boss section for support [of the clutch drum 72], and supply of oil pressure 10a as a holddown member of the sun gear S1 of the moderation planetary gear G1, it becomes unnecessary to have prepared the support member for sun gear immobilization separately, and the part and miniaturization have accomplished.

[0115] Moreover, since the sun gear S1 of the moderation planetary gear G1 was fixed having extended the stator shaft 45 and having used the tip of a stator shaft as before side boss section 10a, the miniaturization of the whole moderation planetary gear by minor-diameter-izing of a sun gear S1 is attained, and the shaft-orientations dimension of an automatic transmission is shortened by arranging the moderation planetary gear G1 by this miniaturization to the inner circumference side of the friction member 73 of the 3rd clutch (C-3).

[0116] Furthermore, the moderation planetary gear G1 are arranged among the hydraulic servos 6 and 7 of the 1st clutch and the 3rd clutch. By the configuration the cylinder 70 which constitutes one side of these hydraulic servos was supported by the periphery of the before side boss section free [rotation], and the cylinder 60 which constitutes another side of a hydraulic servo was supported by whose periphery of an

input shaft 11 free [rotation] Since only a part with the small path of a supporter can take the projected net area of a piston 61 greatly as compared with the case where a hydraulic servo is supported, on a before [the change gear case 10] side boss section 10a periphery, reservation of torque capacity is easy.

[0117] Moreover, since transfer torque capacity is small and the clutch (C-2) which can make the diameter of a clutch small has be arrange at the backmost part of a change gear style as characteristic effectiveness by having apply the configuration of this invention to vertical type arrangement, the outer diameter of an automatic gear change posterior part can be make small, and effect on a vehicle indoor tooth space can be make small.

[0118] Output-shaft 19A has crevice 19a which counters the edge of an input shaft 11 formed, and is supported by the posterior part of an automatic transmission. Moreover, an input shaft 11 The point which counters the front end section of output-shaft 19A is fitted in crevice 19a of an output shaft, and the back end section is supported there. The supply way of the oil pressure to the hydraulic servo 5 of the 2nd clutch C-2 It is formed over the back end section of an input shaft 11 from output-shaft 19A. 11s of oilways for automatic gear change inside-of-a-plane section lubrication Since it is ahead formed from the back end section in which 11t of supply ways in an input shaft 11 was formed It compares, when putting side by side two oilways for the oil pressure for clutch actuation, and lubricating oil supply in the input-shaft back end section. Only the part can make small the path of the input-shaft 11 back-end section inserted in crevice 19a of output-shaft 19A, and the path of the input-shaft posterior part fitted in crevice 19a of output-shaft 19A for support of the back end section of an input shaft 11 can be made small. Therefore, according to this configuration, the outer diameter of the posterior part in an automatic transmission can be made small also from the field of a shaft diameter, and effect on a vehicle indoor tooth space can be further made small.

[0119] Furthermore, since the friction member 93 is used as the friction member of many plates and the hydraulic servo 9 is arranged at the backmost part of a change gear, the 2nd brake (B-3) can use the back end wall of the automatic-transmission case 10 as an oil pressure servo cylinder, and *****ing of it to the change gear case exterior like [in case a hydraulic servo is a band brake] is lost, and it does not make the tooth space of a vehicle room small. Moreover, in the case of a band brake, the force to a certain direction is applied by the engagement to the carrier with which a band brake is arranged, and this has a bad influence on centering and support of a planetary-gear set or support of the input shaft with which the planetary-gear set is supported, or centering. Therefore, it is necessary to enlarge the bush, the bearing, or the input shaft itself for supporting an input shaft and a planetary-gear set. However, in this operation gestalt, since the 2nd brake (B-3) is a multiple disc brake, it does not have the following and can be used as a compact automatic transmission.

[0120] Finally, drawing 20 shows the 11th operation gestalt which changed the connection relation between the moderation planetary gear G1 and the 1st and 3rd clutches (C-1, C-3) into the same thing as the case of the 1st - the 9th operation gestalt to the 10th operation gestalt in the cross section [-izing / the cross section / the ** type]. With this gestalt, the clutch hub 64 which engages with the inner circumference side of the friction member 63 of the 1st clutch (C-1) It connects with the carrier C1 of the moderation planetary gear G1 through the clutch hub 74 of the 3rd clutch (C-3). The clutch drum 62 which engages with the periphery side of the friction member 63 of the 1st clutch The hydraulic servo 6 which connects with the sun gear S3 of the minor diameter of the planetary-gear set G, and is connected [sun gear] at the clutch drum 62 of the 1st clutch is arranged towards the sense which carries out opening of the cylinder 60 to the moderation planetary-gear G1 side.

[0121] As mentioned above in the 1st operation gestalt, the advantage by the connection relation of both such clutches is using the oil pressure servo cylinder 60 of the 1st clutch as a power transfer member, reduces the members which cross between elements in the direction of a path, and is in the point that the axial length of a change gear can be shortened.

[0122] as mentioned above, although this invention was explained in full detail based on the typical operation gestalt, this invention can be variously looked like [each claim of a claim] within the limits of the matter of a publication, and can change and carry out the concrete configuration of details.

[Translation done.]

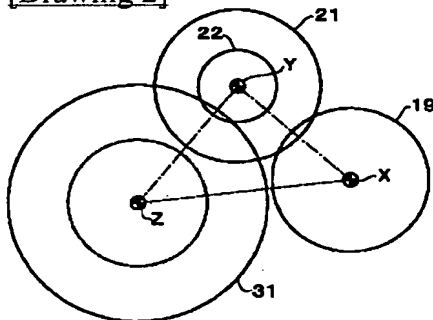
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2. **** shows the word which can not be translated.
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DRAWINGS

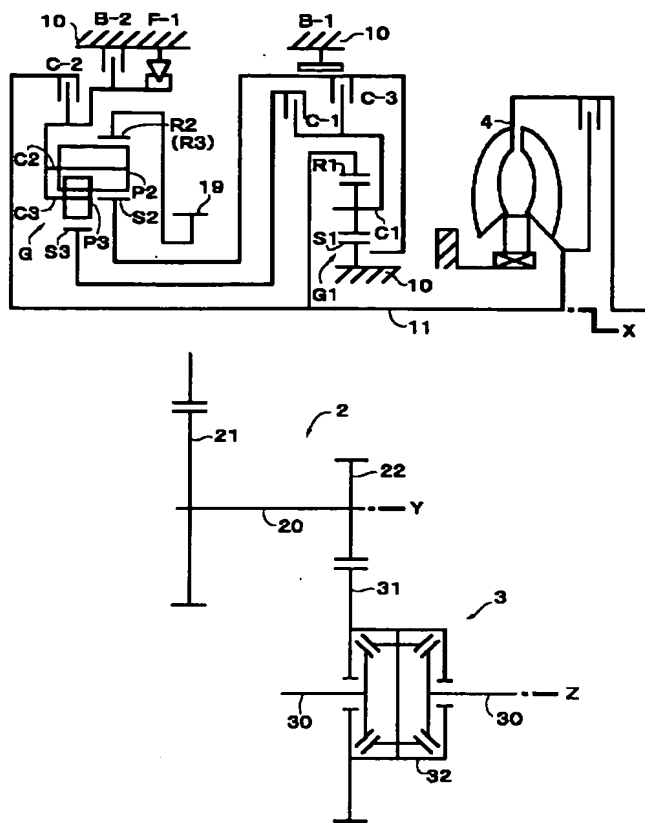
[Drawing 2]



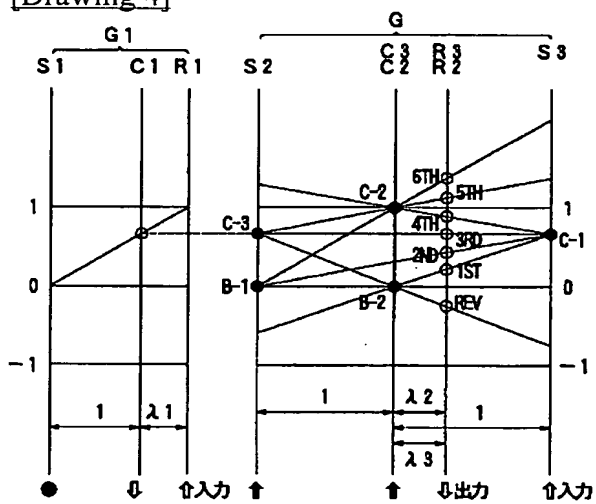
[Drawing 3]

| | C-1 | C-2 | C-3 | B-1 | B-2 | F-1 | ギヤ比 | ステップ |
|-----|-----|-----|-----|-----|-----|-----|-------|------|
| P | | | | | | | | |
| REV | | | ○ | | ○ | | 3.389 | |
| N | | | | | | | | |
| 1ST | ○ | | | | (○) | ○ | 4.067 | 1.73 |
| 2ND | ○ | | | ○ | | | 2.354 | 1.61 |
| 3RD | ○ | | ○ | | | | 1.564 | 1.35 |
| 4TH | ○ | ○ | | | | | 1.161 | 1.35 |
| 5TH | | ○ | ○ | | | | 0.857 | 1.25 |
| 6TH | | ○ | | ○ | | | 0.684 | |

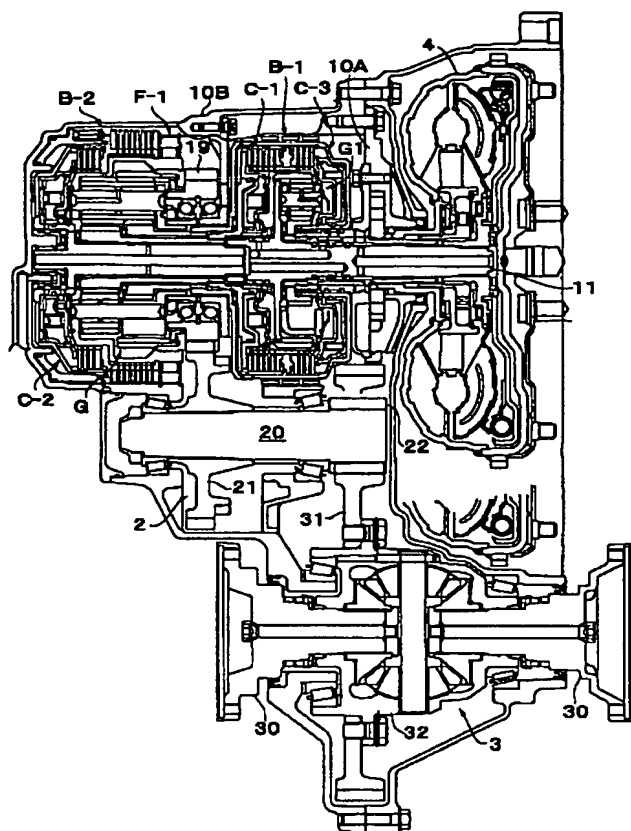
[Drawing 1]



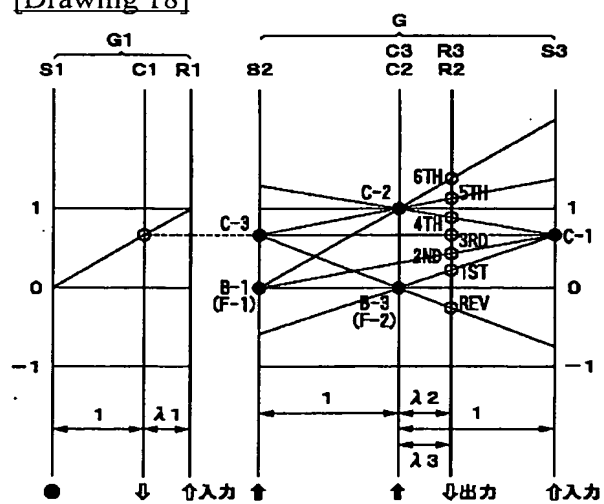
[Drawing 4]



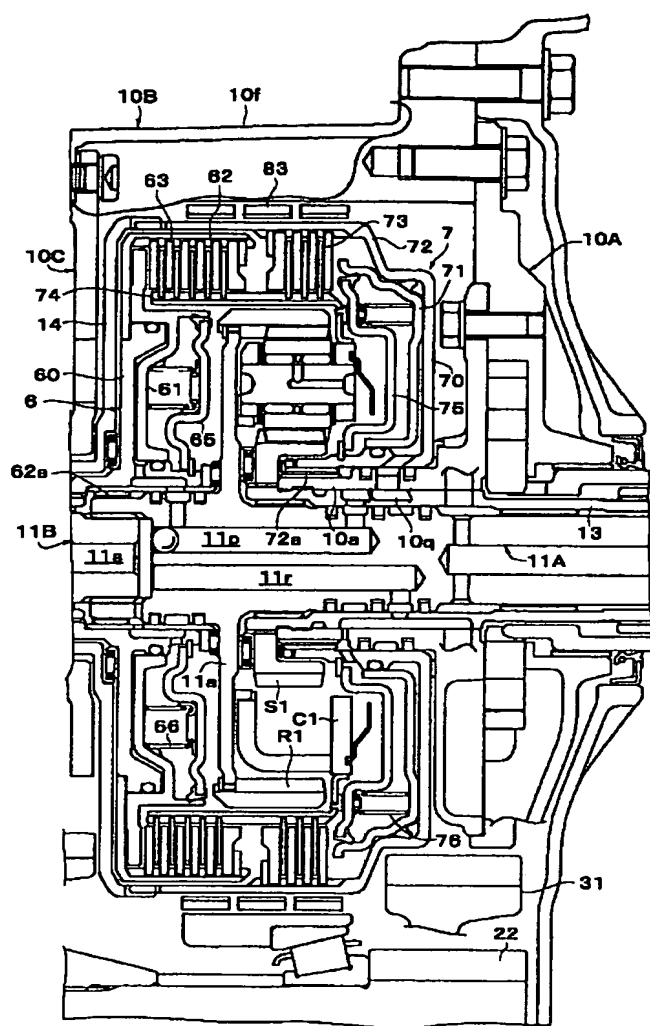
[Drawing 5]



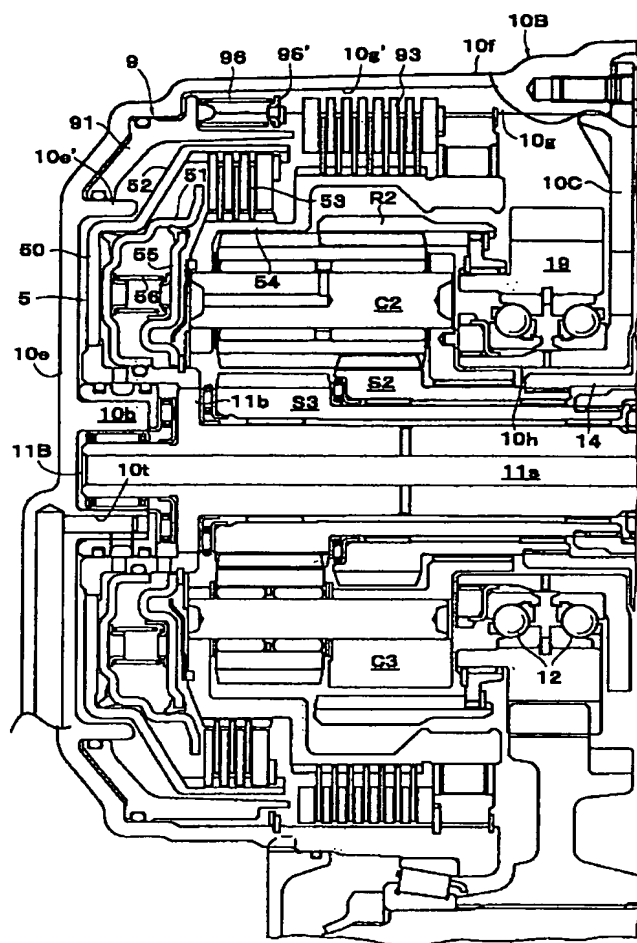
[Drawing 18]



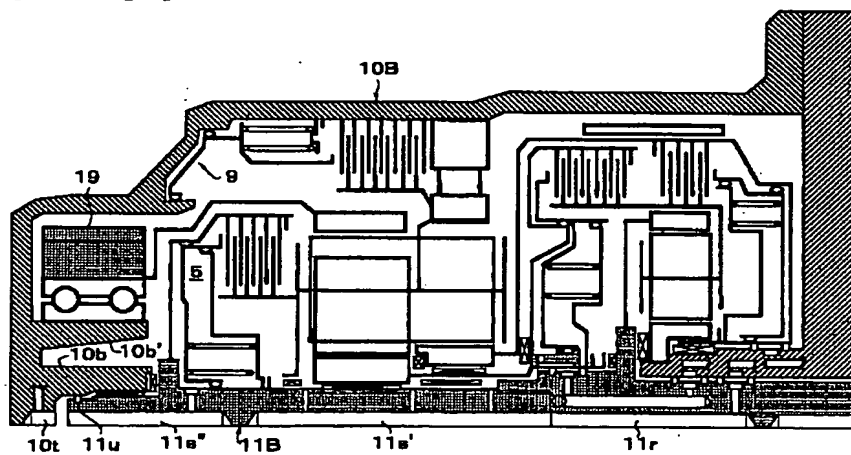
[Drawing 6]



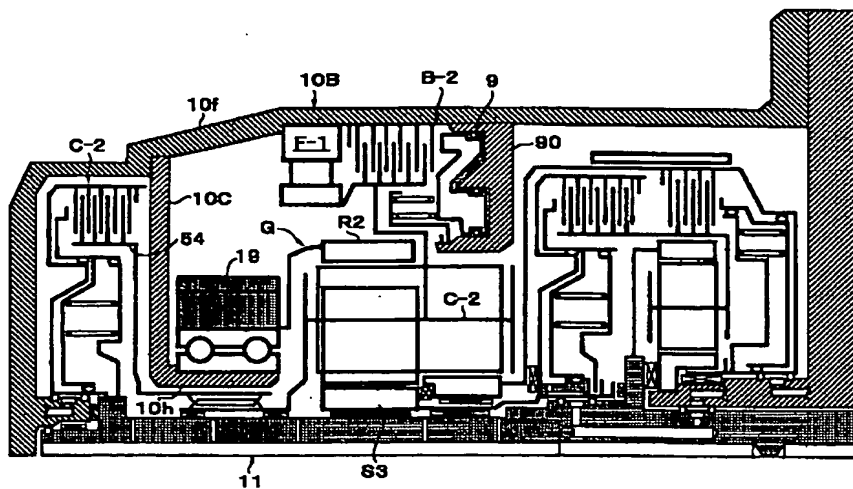
[Drawing 7]



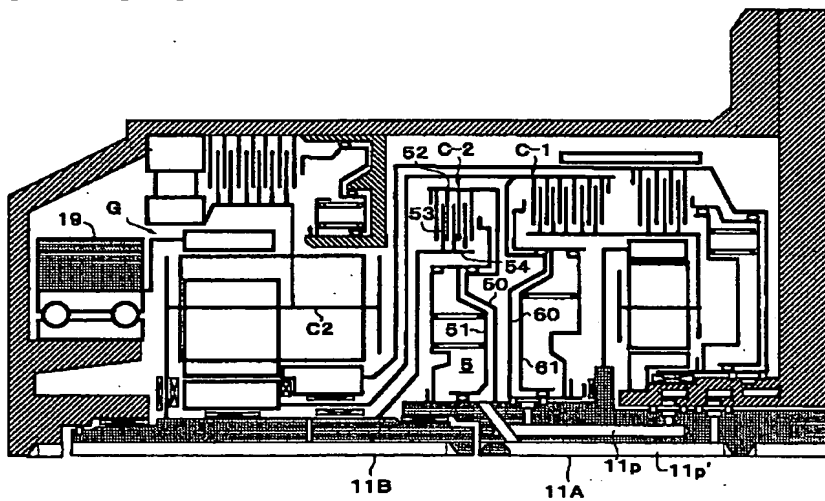
[Drawing 8]



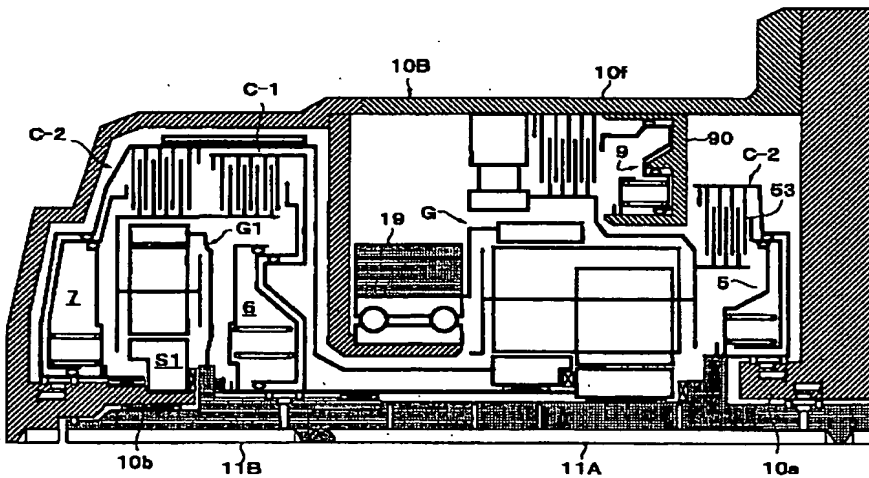
[Drawing 9]



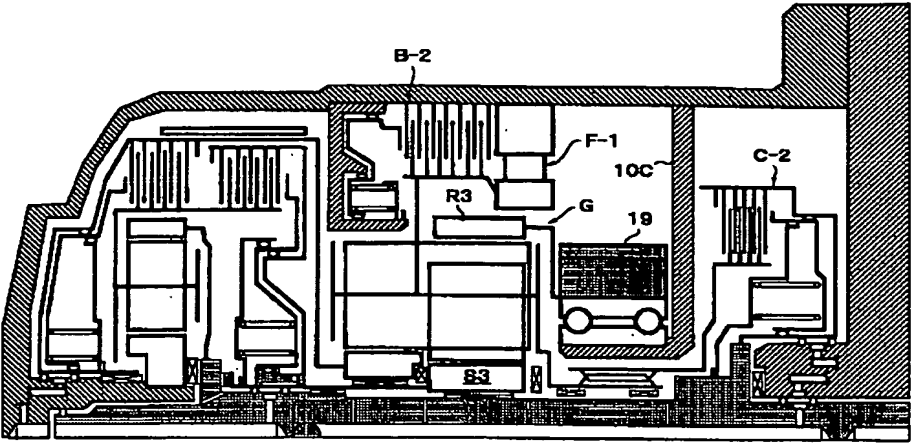
[Drawing 10]



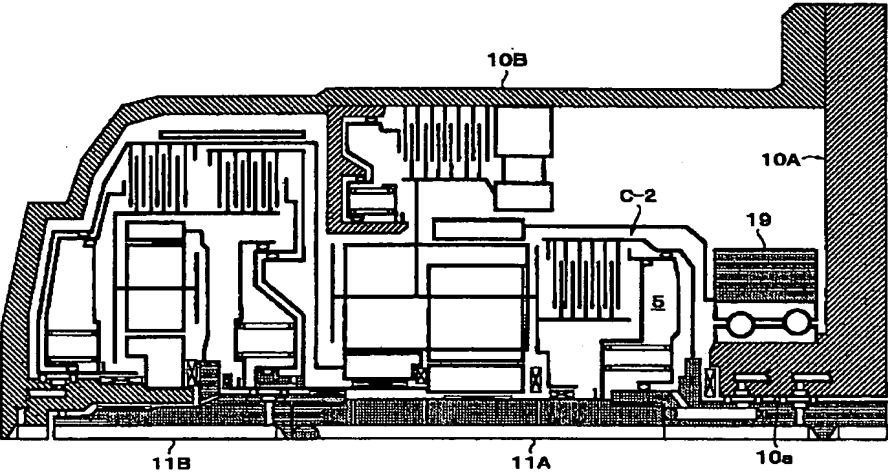
[Drawing 11]



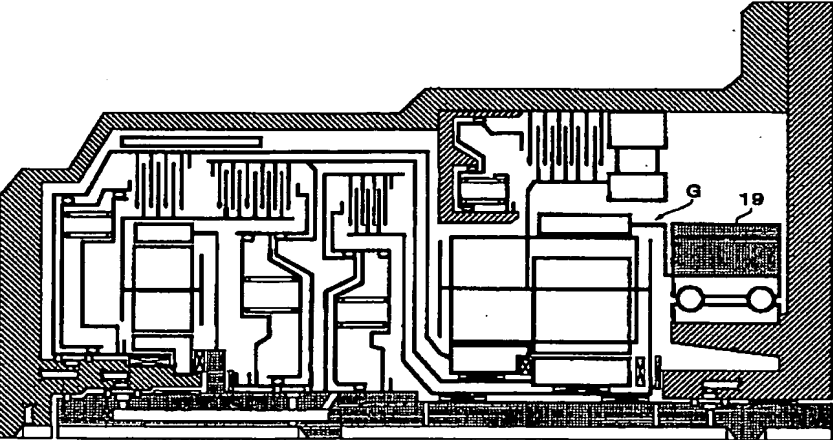
[Drawing 12]



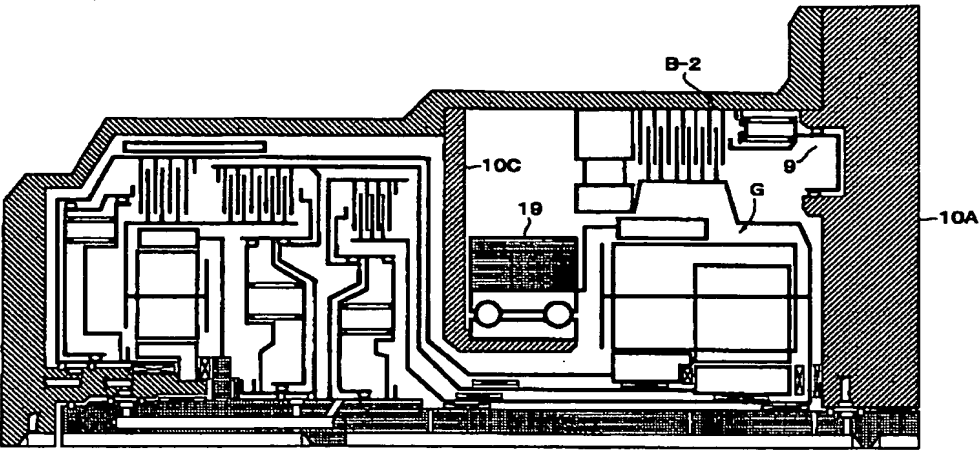
[Drawing 13]



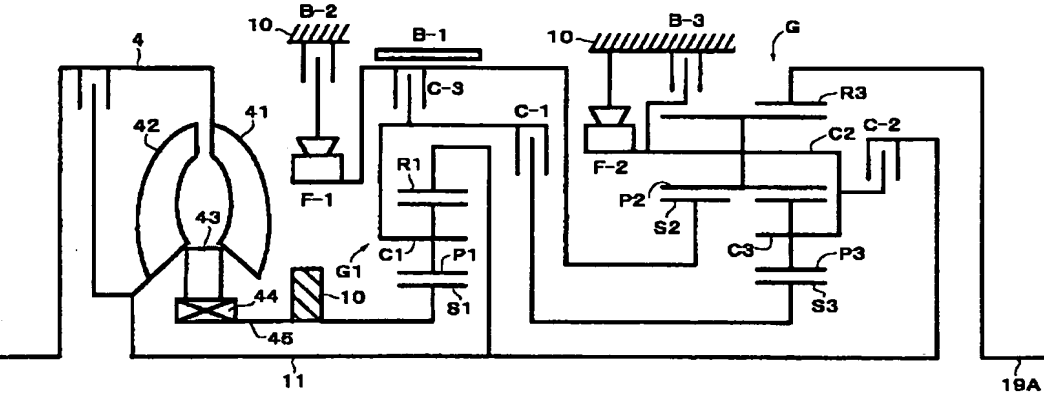
[Drawing 14]



[Drawing 15]



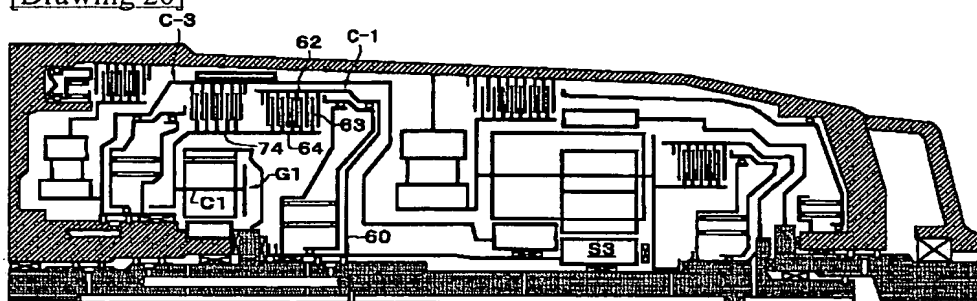
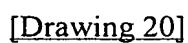
[Drawing 16]



[Drawing 17]

| | C-1 | C-2 | C-3 | B-1 | B-2 | B-3 | F-1 | F-2 | ギヤ比 | ステップ |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|
| P | | | | | | | | | | |
| REV | | | ○ | | | ○ | | | 3.394 | |
| N | | | | | | | | | | |
| 1ST | ○ | | | | | △ | | ○ | 4.148 | 1.75 |
| 2ND | ○ | | | △ | ○ | | ○ | | 2.370 | 1.52 |
| 3RD | ○ | | ○ | | ● | | | | 1.558 | 1.35 |
| 4TH | ○ | ○ | | | ● | | | | 1.155 | 1.34 |
| 5TH | | ○ | ○ | | ● | | | | 0.859 | 1.25 |
| 6TH | | ○ | | ○ | ● | | | | 0.888 | |

[Drawing 19]



[Translation done.]

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